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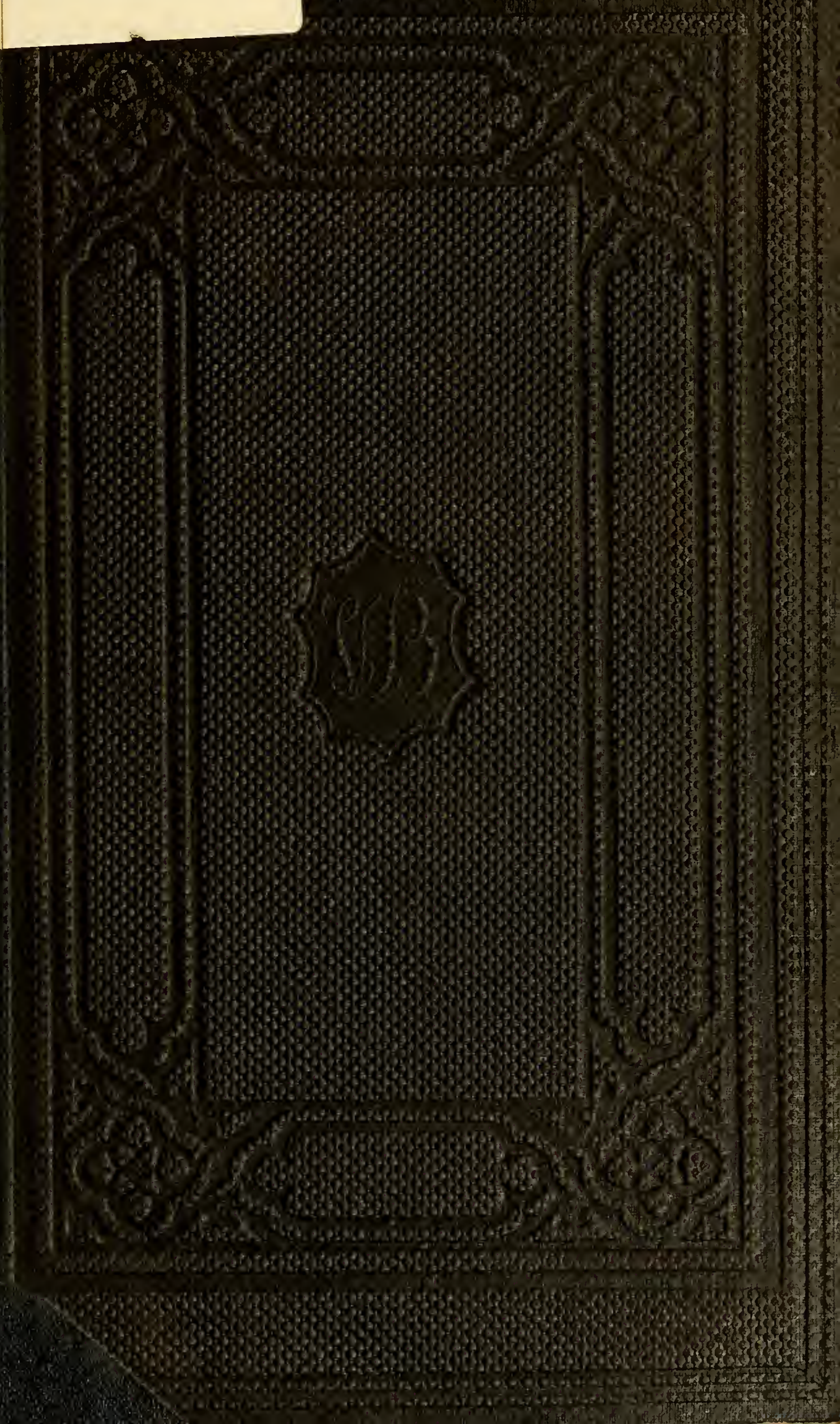

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ANNUAL REPORT

OF THE

AMERICAN INSTITUTE,

OF THE

CITY OF NEW YORK,

FOR THE YEARS

1863, '64.

ALBANY:
COMSTOCK & CASSIDY, PRINTERS.
1864.

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TABLE OF CONTENTS.

PAGE.
Officers of the American Institute, 1863–64 v, vi
Faculty of the Institute vi
Letter of the Corresponding Secretary to the Speaker of the House of Assembly, March 25th, 1864 vii
Report of the Trustees of the American Institute, March 24th, 1864 1–6
Proceedings of the Institute 7–41
Report of the Committee on Agriculture, February 2, 1864 7–8
Report of the Committee on Manufactures Science and Art, February 2, 1864 9–10
Report of the Library Committee, January 29, 1864 11–12
Report of the Finance Committee, February 1, 1864 13–15
Report of the Board of Managers of the Thirty-fifth Annual Fair, February 3, 1864 16–41
Premiums awarded by the Managers of the Thirty-fifth Annual Fair 22–38
Address of Gen. Wm. H. Anthon, at the opening of the Thirty-fifth Annual Fair, September 3, 1863 42–44
Anniversary address, by Chas. P. Daly, LL.D., on the origin and history of institutions for the promotion of the useful arts, November 11, 1863 45–77
Proceedings of the Farmers' Club, together with the rules and regulations adopted by the Committee of Agriculture 78–384
Proceedings of the Polytechnic Association, with the rules established for its government by the Board of Science and Art 385–657

AMERICAN INSTITUTE.

Trustees and Committees.

1863.

President—WILLIAM HALL.

Vice-Presidents—Dudley S. Gregory, Edward Walker, Sylvester R. Comstock.

Recording Secretary—Thomas McElrath.

Corresponding Secretary—John Torrey.

Treasurer—Benedict Lewis, jr.

Finance Committee—Thomas M. Adriance, John M. Reed, William S. Slocum, Thomas Williams, jr., George Peyton.

Managers of the Fair—Wm. H. Butler, James C. Baldwin, Wm. Ebbitt, Wm. S. Carpenter, Thomas F. De Voe, John V. Brower, George Timpson. Andrew Bridgeman, John B. Peck, George Peyton, James Knight, William Cotheal, Henry Steele, George M. Woodward, George R. Jackson, Jas. R. Smith, Clarkson Crolius, John G. Bergen, J. S. Underhill, Warren Rowell, J. Groshon Herriet, J. Owen Rouse, William West.

Committee on the Library—William Hibbard, Jireh Bull, Jas. K. Campbell, Russell Smith, Jacob L. Baldwin.

Committee on Agriculture—James J. Mapes, William Lawton, Adrian Bergen, W. S. Carpenter, Edward Doughty.

Committee on Manufactures, Science and Art—Charles A. Joy, John D. Ward, Joseph Dixon, James L. Jackson, Samuel D. Tillman.

Committee on Commerce—Rush Patterson, Luther B. Wyman, Hiram Dixon, T. Spencer Kirby, John P. Veeder.

Committee on the Admission of Members—Robert Lovett, John W. Chambers, William A. Leffingwell, Joseph Lamb, Charles Pilla.

Committee on Correspondence—John H. White, Joseph Hoxie, Henry L. Stuart, John W. Avery, George F. Barnard.

Committee on Repository—Martin E. Thompson, James Bogardus, John B. Rich, Thomas D. Stetson, Frank Dibben.

Clerk and Librarian—John W. Chambers.

Messenger—Wm. Christie Miller.

1864.

President—WILLIAM HALL.

Vice-Presidents—Dudley S. Gregory, Edward Walker, John Gray.

Recording Secretary—Jireh Bull.

Corresponding Secretary—Thomas McElrath.

Treasurer—Sylvester R. Comstock.

Finance Committee—Thos. M. Adriance, Nathan C. Ely, Cyrus H. Loutrel, Thos. Williams, jr., George Peyton.

Managers of the Fair—William H. Butler, James C. Baldwin, Wm. Ebbitt, William S. Carpenter, Thomas F. De Voe, George Timpson, Andrew Bridgeman, John B. Peck, Jas. Knight, William Cotheal, J. Groshon Herriot, J. Owen Rouse, Geo. M. Woodward, George R. Jackson, James R. Smith, John B. Rich, I. M. Ward, Isaac Buchanan, Jonathan N. Tifft, J. S. Underhill, Jeremiah Simonson, William W. Marston, R. G. Hatfield, Thomas Smull.

Committee on the Library—William Hibbard, James K. Campbell, Chas. P. Daly, Jacob L. Baldwin, Ebenezer H. Brown.

Committee on Agriculture—James J. Mapes, Isaac P. Trimble, John G. Bergen, William S. Carpenter, William West.

For Committee on Manufactures, Science and Art—John D. Ward, Joseph Dixon, Charles A. Joy, James L. Jackson, Samuel D. Tillman.

Committee on Commerce—Rush Patterson, Luther B. Wyman, Wm. K. Strong, T. Spencer Kirby, John P. Veeder.

Committee on the Admission of Members—Robert Lovett, John W. Chambers, William A. Leffingwell, Charles E. Burd, Charles Pilla.

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Committee on Repository—Martin E. Thompson, James Bogardus, Albro Howell, Thomas D. Stetson, Frank Dibben.

Clerk and Librarian—John W. Chambers.

Messenger—David N. Jacobus.

FACULTY.

James J. Mapes, Professor of Natural Philosophy and Chemistry as applicable to the Useful Arts.

Julius G. Pohlé, M. D., Professor of Analytical Chemistry.

Samuel D. Tillman, A. M., Professor of Mechanical Philosophy and Technology.

State of New York.

No. 202.

IN ASSEMBLY,

March 28, 1864.

TRANSACTIONS OF THE AMERICAN INSTITUTE.

American Institute,
New York, *March 28th*, 1864.

To the Honorable Thomas G. Alvord,
Speaker of the Assembly of the State of New York, Albany:

Sir—I herewith transmit the Annual Report of the American Institute of the City of New York for the years 1863–4.

I have the honor to be,
With much respect,
Your obedient servant,
THOMAS McELRATH,
Corresponding Secretary.

REPORT OF THE TRUSTEES

OF THE AMERICAN INSTITUTE OF THE CITY OF NEW YORK.

To the Honorable Legislature of the State of New York:

The Trustees of the American Institute, in conformity with law, beg leave to present their annual report for the years 1863–4.

On the second day of April last, the American Institute passed a series of resolutions in relation to the great International Agricultural Exhibition, to be held in the city of Hamburg, one of the free cities of Germany, these resolutions were printed in circular form and sent to the various Agricultural Societies throughout the United States, urging them to forward contributions of the inventions and improvements in agricultural implements and machinery, and also specimens of the agricultural products of the country. A copy of the resolutions were transcribed in the German language and forwarded to his Excellency Baron Ernst von Merck, the chairman of the Hamburg Exhibition Committee.

Three delegates were appointed to visit and report upon the exhibition, viz: Messrs. Austin Baldwin, Jos. H. Anderson and C. W. Wennberg.

Baron von Merck, by a letter received by the President, dated June 9, 1863, acknowledged the receipt of the resolutions, and tendered the Institute the warmest thanks for the interest taken by the Institute, for the success of the Exhibition, and assuring them that Hamburg would do all in her power to receive, in a suitable manner, the representatives sent to the Exhibition.

This communication was read at the meeting of the Institute, on the 20th of August, and ordered on file.

We regret to announce that before the arrival of our delegates, and before the Exhibition had opened its vast collection to the public, Baron von Merck, under whose enlarged views and extensive influence in the National Counsels, it had been mainly projected, was suddenly stricken down by the hand of death, and the Exhibition lost one of its ablest directors, and his countrymen one of its most estimable citizens.

Austin Baldwin, Esq., one of our delegates to this Fair, makes the following report:

To the President and Members of the American Institute of the City of New York:

Gentlemen—Having been honored with an appointment as a delegate to the German International Agricultural Exhibition held at the city of Hamburg, in July last, I beg leave to make the following report:

That I embarked for Hamburg via Bremen, on the 20th of June last, and arrived there about one week previous to the opening of the Exhibition, and was received with all the courtesy due to the position with which I was honored. I found the arrangements for the exhibition were nearly completed, and that they had been made upon a scale of great liberality, reflecting the highest credit upon the Executive Committee, as well as the city of Hamburg, a large field of upwards of 80 acres had been enclosed with a high substantial fence, convenient sheds had been erected several miles in extent, supplied with water which had been brought upon the grounds, and distributed in every part, by nine miles of pipe used for that purpose, large temporary buildings for the convenience of the committees, as well as for the delegates of different nationalities, with suitable decorations, were erected in the central portion of the grounds, the flags of all nations were flying in the greatest profusion, among which, over the grand entrance, the stars and stripes of our country held an honorable position. The whole effect was that of a newly built town rather than the temporary fixtures of an Exhibition.

The untimely death of Baron Ernst von Merck, the president of the Executive Committee, whose wealth and influence had been freely used in this enterprise, occurring suddenly at this time, appeared at first to render its success quite doubtful, but the energy of the committee, rising with the occasion, overcame all obstacles, and carried it triumphantly through.

To attempt a detail of the exhibition would extend this report beyond all proper limits. As an idea of its extent, I would state that, being upon the jury for agricultural implements and machinery, it took seven days to give it a very superficial examination. About forty acres of ground were covered by machinery and implements of every description, of which the English were much the largest contributors; some of the leading English manufacturers had loaded vessels, and brought large forces of men to put their machinery in operation.

Our American contributions, though small in extent, compared with those of other countries, excited much interest, and were generally considered as better adapted to the wants of the people of Northern Europe than those from any other quarter. All that was sent out to be sold, with but few insignificant exceptions, found a ready market, and one hundred thousand dollars worth would doubtless have been taken on the ground had it been sent over.

About four thousand head of the finest stock in Europe was gathered at the exhibition; yet I am happy in being able to state that the only stock exhibited by us, which were twelve Spanish merino sheep from Vermont, took the highest of the liberal premiums offered by the committee, and they were sold on the ground to a nobleman from Silesia, for the enormous sum of one thousand pounds sterling, equivalent to over seven thousand dollars in our currency.

The Queen of England sent some of the finest animals from the late Prince Albert's model farm, and the Emperor of France exhibited some of his best horses, which might be seen making their rounds in charge of the grooms in the imperial livery. The splendid cattle, of all shades of color, from a pure milk white to the deepest black, large in size and in beautiful proportion, altogether combined to make this an exhibition unsurpassed in its kind by any which have ever been known.

The premiums received by our contributors were fully in proportion to the number of our contributions. Our distinguished fellow citizen, C. H. McCormick, Esq., was there with his magnificent prize reaper which took the first premium at the London exhibition, which, for elegance and perfection of workmanship, probably excels any agricultural machine in existence, being of oak highly polished, with all the iron and steel work upon it finished in the best manner. For this and another machine with which the working trial took place, he received the highest premium—a gold medal; while Messrs. Seymour and Morgan, of our State, stood next in order, receiving a large silver medal for a very superior self-delivering reaper.

Medals were also given to Messrs. Vanderbilt of this city, for agricultural implements; to Messrs. R. H. Allen, Messrs. Wendt & Co., and Mr. Johnson, the latter for washing machines. To Messrs. Hale & Parshall, and to Messrs. Hotchkiss & Co., for essential oils, manufactured at Lyons, in this State, were also awarded medals.

I deem it proper that I should bring to your notice our deficiencies in regard to plows, in which I regret to state the English makers were decided by the committee to possess a decided superiority. As this is so important an implement of agriculture, I would respectfully suggest, that at the next exhibition held under the auspices of your Society, that inducements may be held out for the improvement of the construction of the common plow, and it would be worthy of consideration whether it would not be judicious to extend an invitation to English manufacturers to enter for competition.

I would also beg leave to state that plowing by steam was performed during the Exhibition, with complete success, and if by the ingenuity of our citizens, the English method could be so far modified as to diminish the cost of machinery so far as to make its introduction practicable in this country, it would be productive of infinite benefit to the agricultural interest of the whole Union.

In a short address which I had occasion to make at the close of the Exhibition, I took occasion to allude to the "AMERICAN INSTITUTE" as having done more to advance the general interests of American industry than any other association in existence, of the truth of which, from my long acquaintance with its useful career, I have ever been fully impressed, and in concluding this report, I would take the liberty of suggesting that if, by the influence of your society, there could be established an association for the improvement of agricultural machinery and implements, which should gather together the most improved models of all kinds of instruments used in tilling the lands and securing crops, similar to that which our German friends decided to establish, in the form of an Agricultural Museum, you would but add to that sphere of usefulness which you have so long and honorably filled.

All of which is most respectfully submitted by

Your obedient servant,
AUSTIN BALDWIN,
Delegate from the American Institute.

Nov. 17, 1863.

A Fair was held during the past year under the auspices of the Board of Managers, at the Academy of Music. Their report will be found annexed.

The property of the Institute, No. 351 Broadway and No. 89½ Leonard street, has been leased for three years from the 1st of May next, at the annual rent of eight thousand dollars, being an advance of $2,500 on the rent received during the last two years. Some necessary repairs have been made to the premises at a cost of $400.

The Trustees think that the time has arrived when this property should be sold. They have advertised it in accordance with the By-Laws, and for the purpose of bringing the subject before the Institute, they called a special meeting on the 20th of January last, at which meeting the proposition was fully discussed. As authority to sell can only be passed at a regular meeting, it is hoped that full power will be given to the Trustees to carry this important subject into effect.

The Institute owns two lots in Greenwood Cemetery, on which a monument was erected some years since to the memory of Mr. Thaddeus B. Wakeman, its former Corresponding Secretary. The Trustees have had the iron railing and the letters on the monument repainted.

It is gratifying to state that both the Farmer's Club and Polytechnic Association of the Institute, have been well attended during the past year, many interesting subjects in relation to agriculture, science and art, have been discussed.

These discussions will be found very fully reported in the proceedings annexed.

The Library continues to increase in the number of volumes and readers. The purchases continue to be principally confined to scientific works.

The report of the Finance Committee exhibits the state of the finances on the 31st day of January last.

During the past year seventy-four candidates were admitted as members of the Institute.

The Anniversary Address before the Institute was delivered in the hall of the New York Historical Society, by the Hon. Chas. P, Daly, on the evening of the 11th of November last. The subject was the origin and history of Institutions for the promotion of the Useful Arts; this address was very interesting in its details, giving a concise history of industrial institutions from the earliest period, it fully confirmed the reputation of the orator, exhibiting great research, industry and talent, at the close of which the audience passed a unanimous resolution, requesting that a copy of the same should be furnished for the use of the Institute.

A committee has been appointed to confer with the officers of the Metropolitan Fair for the benefit of the United States Sanitary Commission, tendering them the aid of such committees of the Board of Managers as may be acceptable. The offer was received most gratefully, and considered quite opportune, and a committee was appointed to confer with our committee upon some plan of co-operation.

In consequence of the death of James R. Chilton, Professor of Analytical Chemistry, and James Renwick, Professor of Mechanical Philosophy, of the Institute, the trustees have selected to fill the vacancies Julius G. Pohlé for Professor of Analytical Chemistry, and Samuel D. Tillman, Chairman of the Polytechnic Association, for Professor of Mechanical Philosophy and Technology. It is believed that these appointments will be of advantage to the

Institute, and that during the year these gentlemen will deliver a course of lectures before the Institute.

All of which is respectfully submitted.

WILLIAM HALL,
D. S. GREGORY,
S. R. COMSTOCK,
EDWARD WALKER,
THOMAS McELRATH,
BENEDICT LEWIS, Jr.,
Trustees.

New York, *March* 24, 1864.

PROCEEDINGS OF THE INSTITUTE.

REPORT OF THE COMMITTEE ON AGRICULTURE OF THE AMERICAN INSTITUTE.

The Committee on Agriculture of the American Institute, in pursuance of the 49th section of the by-laws, beg leave respectfully to report:

Your committee, in accordance with the duties prescribed for them, have actively carried out the purposes of the Institute entrusted to their care.

The great International Fair at Hamburg is not among the least interesting events of the year, and from the able report made by Austin Baldwin, Esq., we learn that the American Institute was properly represented on that occasion. This report, which will be read to you, places the fact of the superiority of American agricultural machinery fairly on record.

Your committee report with sorrow the loss of one of their most efficient members, Edward Doughty, Esq., of Newark, N. J., who died on the 20th day of June last, after a long and useful life.

The Farmers' Club of this Institute was the first of its kind in this country, and its peculiar rules of order have been the model of hundreds of similar societies. Your committee have been regular attendants upon this useful adjunct, and with the assistance of many members of the Institute and others, have been able to render the meetings most interesting. Among the attendants are to be found some of the most able pomologists of the country, and every novelty connected with the protective art has been, to a greater or less extent discussed at these meetings. The suggestions of scientific men and enthusiasts have met the chastening influence of practical and operative members.

The number of letters of inquiry received by the Club, and responded to by committees, members, etc., has been large, and generally have been written in consequence of the reports of the Club meetings published in the New York Tribune, whose agricultural editor is always in attendance, and supplies much of the miscellaneous matter which occupies the deliberations of the Club.

In addition to the discussions of miscellaneous matters, the following list of subjects have each occupied one or more meetings, and elicited all the known facts in relation to them:

Alianthus tree.
Artificial breeding of trout.
Cement cisterns.
Cultivation of cabbage.
Flax culture.
Fencing and fences.
Fruits—Apple.
    Currant.
    Gooseberry.
    Grapes.
    Pear.
    Raspberry.
    Strawberry.
Guano.
Grapes.
How to grow plants from slips.
Insects injurious to vegetation.
Influences of the moon on vegetation.
Lampas in horses.
Laws to prevent cattle running in the highways.
Licorice.
Manures.
Qsage orange for hedges.
Osier willows.
Peat.
Potatoes—preserving, planting, new varieties, rot.
Shade trees.
Sorghum.
Stacking in the open air.
Subsoil plowing.
Sumach.
Value of corn stalks for forage.
Wash for trees.

The reports of transactions of the Club have been ably collated by Mr. John W. Chambers, and many of them will be found embodied in the published transactions of the Institute.

All of which is respectfully submitted.

JAMES J. MAPES,
WILLIAM S. CARPENTER,
ADRIAN BERGEN,
Committee,

New York, *February 2d*, 1864.

REPORT

OF THE COMMITTEE ON MANUFACTURES, SCIENCE AND ART OF THE AMERICAN INSTITUTE.

The Committee on Manufactures, Science and Art, report:

That during the past year but two inventions have been submitted to them for examination, and each was a subject of a brief report to the Institute.

The Autumnal Fair in 1863 afforded ample opportunity for the exhibition of novelties and their examination by competent judges has precluded any reference to your Committee.

They have the satisfaction of reporting favorably with regard to the action of the Polytechnic Association, whose organization and interests are committed to their charge. By the re-appointment of one of their own number, S. D. Tillman, Esq., as Chairman, they have had the means of direct communication at all times with it. A majority of your Committee have attended some of its meetings during the past year, and can bear testimony to the high character of its debates upon technological questions, and its impartial scrutiny of new inventions. Mr. Benjamin Garvey was appointed Secretary in November last. A prominent object of the Polytechnic being to offer all classes of inventors and discoverers facilities for bringing their novelties before the public, free of expense, a portion of the time of each meeting is set apart for their benefit.

It is evident that discussions, depending upon a few regular, and the many casual attendants of these meetings, may sometimes be devoid of original views; there is also danger of a sameness of treatment where subjects are committed to a comparatively small number of speakers. To guard, in some measure, against a flagging interest in these meetings, and to insure the presentation of subjects new and important, the Chairman has undertaken to prepare for each meeting a summary of scientific intelligence, chiefly gleaned from foreign journals, thus offering a new inducement for regular attendance to those who desire to keep abreast of the progressive movement. He further suggests that a report should be made of the most important patents issued weekly at Washington, thus always ensuring a surplus of topics for discussion, and giving to the Association the characteristics of a Scientific Exchange.

The Polytechnic, during the past year, has had a competent reporter of its proceedings, but during most of the previous year it had neither reporter nor regular secretary, it is therefore matter of surprise and gratification to find its discussions occupying its usual share in the volume of Transactions just published.

The matter is printed in smaller type than heretofore, thus a work of more contents than usual has been embraced in a volume of smaller size.

The supervision of the proceedings of the Polytechnic in their preparation for the press, and the correction of proof, was the voluntary work of the Chairman, assisted by Mr. Chambers, the librarian. The very few typographical errors which will, in no instance, mislead the reader, resulted from the fact that the proof reader and the printer were one hundred and fifty miles apart. The chief topics discussed in the volume—improvements in weapons of war, locks, locomotion, the use of steam expansively, the production, refining and useful applications of petroleum, are interesting alike to all classes of the community, and will doubtless attract very general attention.

Respectfully submitted,

CHARLES A. JOY, *Chairman*,
JOHN D. WARD,
JOSEPH DIXON,
JAMES L. JACKSON,
S. D. TILLMAN,

Committee.

REPORT

OF THE LIBRARY COMMITTEE OF THE AMERICAN INSTITUTE, 1864.

The Standing Committee of the Institute are required by its by-laws to make annual reports.

That duty is performed by the Library Committee with greater pleasure this year, than during the two preceding years. Then, we were threatened by armed invasion, by those who are of the same nationality. Now, we have the cheering evidence that rebellion is circumscribed into narrower limits, and the loyal inhabitants of a free republic, are already congratulating themselves, that armed rebellion against the government of the United States, has proved a failure, and that the time has nearly arrived, when our citizens can with confidence, turn their attention to the more peaceful avocations of life. In such anticipations, no one can indulge with more heart-felt emotions than your committee.

The number of volumes in the Library at the date of the last report was		8,477
There has been added during the year,		
By purchase	15	
subscription	26	
exchange	16	
donations	45	
	—	102
Making a total of volumes now in the library		8,579

There has been expended during the past year for the purchase of new books, the sum of	$30.83
For binding	52.16
There has been realized from the sale of old newspapers and pamphlets	38.88

The unexpended amount of former appropriations is $52.23. From this small balance, it will be perceived, that our successors will require an additional appropriation, and it is recommended that the Institute make an appropriation of the sum of five hundred dollars, to be judiciously expended in the purchase of such books as shall promote the interests of those who resort to the library in the furtherance of their scientific enquiries.

The committee state with great pleasure, that negotiations are now pending with great prospect of success, that at no remote period, there will be added to the library, an index of all the patents published at the patent office, in England, comprising about forty volumes. This addition to the library cannot fail to attract the attention of a large class of our citizens as well as non-residents who by their inventive genius, are adding largely annually to the wealth and resources of the nation, which the Institute takes pride in fostering.

At no former period in the history of the Institute has the library assumed a greater importance than during the past year, its rooms are attractive, the members are cordially received, and strangers introduced by them are always warmly welcomed.

Every member has the privilege to suggest the purchase of new books, and it is with no ordinary pleasure, that your committee gives its testimony in favor of the efficiency of the librarian Mr. John W. Chambers.

In view of the large public benefits which it is in the province of this branch of the Institute to confer, may not the hope be indulged, that some patron will be found, who, from his abundance will deem it a privilege to make such an endowment of the Institute, that it will be able to carry out more fully the objects contemplated in its charter.

All of which is respectfully submitted.

WILLIAM HIBBARD,
JAMES K. CAMPBELL,
JIREH BULL,
JACOB L. BALDWIN,
RUSSELL SMITH.

NEW YORK, *January* 29, 1864. *Committee.*

FINANCES.

The following is the financial condition of the American Institute on the 1st day of February, 1864:

Balance in the treasury February, 1863			$299 46
The Receipts of the year, have been:			
From rent of premises No. 351 Broadway and No. 89½ Leonard street		$5,654 54	
Bills payable, amount advanced, and note discounted		1,500 00	
Admission fees and dues, viz: initiation fees, $195; annual dues, $886; life members $140		1,221 00	
Sales of shafting, pullies, hangers, pipe, &c.		396 58	
do old paper and packing cases		51 18	
do Transactions		75	
Managers of the 35th Fair		1,404 63	
Managers sales of old gold after restriking medals		147 69	
Duplicate medals		10 00	
Certificates of award		8 00	
Tenants, arrears of Croton water 1862, '63,		43 70	
			10.438 07
			$10,737 53
Expenditures.			
Real Estate.			
Interest on bond and mortgage, $20,000, 1 year at 6 per cent,	$1,200 00		
Taxes 1863 on real estate	1,455 02		
Croton water 1862, '63	43 70		
Repairs	13 33		
		$2,712 05	
Library.			
Books	$23 58		
Periodicals	55 99		
Binding	52 16		
Newspapers	18 50		
		150 23	
Bills Payable.			
Amount advanced and note	$1,500 00		
Interest	22 56		
		1,522 56	
Carried forward		$4,384 84	$10,737 53

Brought forward		$4,384 84	$10,737 53
On account of 33d Annual Fair.			
Premiums, striking medals and engraving	$21 25		
On account of 34th Annual Fair.			
Printing and advertising,	31 88		
Premiums, striking and engr'g,	9 75		
		41 63	
On account of 35th Annual Fair.			
Amount advanced by resolution August 6, 1863	$1,800 00		
Gas	486 00		
Restriking medals	138 63		
Medal cases	50 00		
Lantern and feather dusters	4 88		
		2,479 51	
Miscellaneous			
Rent of rooms in Cooper Union building 1 year	$1,250 00		
Storage of property used at fairs	43 00		
Insurance real estate	101 71		
" library	32 40		
Printing	20 75		
Stationery	31 65		
Advertising	46 10		
Gas	67 25		
Agents expenses at Albany	16 44		
Professional services	25 00		
Ann. address, use of hall, &c,	28 00		
Framing engraving "International Agr. Exhibition"	10 00		
Freight on Transactions	11 35		
Inspectors of elections expenses	4 50		
Directories	4 00		
Engraving duplicate medals	2 00		
Ice,	6 85		
Incidental expenses,	179 75		
		1,880 75	
Salaries.			
Clerk	$1,500 00		
Messenger	271 00		
		1,771 00	
			10,578 98
Balance in the treasury Feb. 1, 1864			$158 55

THOMAS M. ADRIANCE,
JOHN M. REED,
WILLIAM S. SLOCUM,
THOMAS WILLIAMS, Jr,
GEO. PEYTON,
Finance Committee.

Account of property held by the American Institute Feb. 1, 1864.

Real estate—No. 351 Broadway, and No. 89½ Leonard street, cost	$45,800 00	
Less mortgage	20,000 00	
		$25,800 00
Library and fixtures		13,775 38
Office furniture and fixtures, iron safes, case of models of fruit, &c.		934 75
Property used at the fairs		350 00
		$40,860 13
Cash in the treasury Feb. 1, 1864		158 55
		$41,018 68

REPORT

OF THE BOARD OF MANAGERS OF THE THIRTY-FIFTH ANNUAL FAIR OF THE AMERICAN INSTITUTE, 1863.

The Board of Managers of the Thirty-fifth Annual Fair, in conformity with section 29, of the by-laws, respectfully report:

That the first meeting of the board was held on the 17th of March, 1863, and on the 23d they organized by the election of Mr. William H. Butler as Chairman, Mr. William S. Carpenter, as Vice Chairman and Mr. John W. Chambers as Secretary.

As no public exhibition of the Institute had been held since 1860, and as it is made the duty of the Managers to hold a Fair, unless otherwise ordered by the Institute, it was thought advisable by the Board that the Annual Exhibitions should be revived, accordingly one of the first acts of the Board was to appoint a committee to take into consideration the subject of selecting a proper location for the Fair.

The Committee appointed therefor reported, that after a careful examination of such places as appeared available for such a purpose that the Academy of Music, in Fourteenth street, seemed to possess superior advantages to that of any other, inasmuch as its reputation is favorably known beyond local limits, as well as of its central locality, rendered easy of access by various lines of railroads and omnibusses, and furthermore that the building could be prepared for the Exhibition at comparatively trifling expense.

The selection was approved, and at an early day an official public announcement was made that the Annual Exhibition would be held. It was extensively advertised in the newspapers and the following circular was issued:

"The Board of Managers of the Annual Fair of the American Institute, take great pleasure in announcing to the public that they have rented that spacious and beautiful building, known as the Academy of Music, in Fourteenth Street and Irving Place, for the purpose of holding their thirty-Fifth Annual Exhibition.

This Fair, as those heretofore held under the auspices of the Institute, will be restricted to American productions; it will be general in its character, embracing Manufactures of all kinds, New Inventions, Improvements in Agricultural Implements, and the Mechanic Arts generally, but the machinery will not be propelle by steam power.

A Horticultural Exhibition will be held the last week of the fair in connection with the general Exhibition,

The building will be arranged and ready for the reception of goods on Friday, the 28th of August, and will be opened to the public on Thursday, the 3d of September, and will continue three weeks.

The advantages of the City of New York for holding the Fair, in regard to its accessibility by the various railroads and steamboats from every section of our country, obviously offer unusual facilities for citizens and strangers to visit the Exhibition.

It is extremely desirable that you should communicate, with as little delay as possible, the nature of the articles you intend to exhibit, and the amount of space required for their exhibition.

The exhibitions of the American Institute are not local or sectional in their objects, but all citizens throughout the Union are invited to send their contributions and compete for the premiums, which will be liberal, consisting of gold, silver and bronze medals and diplomas.

Competent and impartial Judges will be appointed, on whose decisions the premiums will be awarded; the Institute, however, will insist on a high standard of excellence, or very decided improvement in all articles competing for premiums.

The utmost efforts of the Institute will be put forth to make this Fair the most select and attractive of any American Exhibition heretofore given.

We therefore appeal to all Manufacturers, Inventors, Artists, Mechanics, Agriculturists, Horticulturists and Florists, who wish to advance their own interests, or to contribute their share in the promotion of the public welfare, to participate in the advantages which this Exhibition offers.

For any information on the subject of the Exhibition, address John W. Chambers, Secretary of the Managers, at the rooms of the American Institute, Cooper Union Building.

Rules and Regulations to be Observed at the Thirty-Fifth Annual Fair of the American Institute of the City of New York, at the Academy of Music.

1. Articles intended for exhibition and premium, should be delivered at the Academy of Music, Fourteenth street, from Friday, August 28th, to Wednesday, September 2d, 1863.

2. No article deposited after Wednesday, September 2d, will be entered on the judges' list for competition or premium, except those for the Horticultural Exhibition, which will be received on Wednesday morning, September 16th.

3. The committee, on the reception of goods, will receive, at their discretion, all articles offered for exhibition, (which, however, must be of American manufacture,) and enter upon blanks provided for that purpose, the name and residence of the manufacturer and agent; also, whether the article is intended for competition or exhibition only, which certificate must then be handed to the entry clerk, who will give a ticket and card, which card must be attached to the article. The ticket, which is not transferable, will admit the exhibitor to the fair at all times when open to the public.

The door-keepers are instructed to retain such tickets when presented by any other than the exhibitor.

In case of the loss of the ticket, the exhibitor is directed to give the clerk immediate notice in writing, in order to prevent the loss of the article, as the tickets are taken as sufficient evidence of ownership in delivering the articles at the close of the fair.

4. Proof of origin must be furnished, if required, for every article offered for premium, and persons offering articles for competition are requested to state, in writing, their peculiarities and novelties, that the attention of the judges may be called thereto when they make their examinations.

5. Apprentices offering articles of their own production for competition must give, at the time of entry, a certificate from their employers, stating their age and the time they have served at the business.

6. Disinterested and competent judges will be appointed to examine all articles offered for competition, and the managers will award premiums of gold, silver and bronze medals and diplomas on such articles as the judges shall decide most meritorious. They will be announced during the Fair, and the premiums will be delivered thereafter as soon as they can be prepared. But in no case, for want of competition or for other cause, will any article be entitled to premium if adjudged intrinsically not deserving of particular commendation.

7. Whenever the articles will permit, the exhibitors are requested to exhibit their goods in glass cases.

All articles at the Fair are, however, *at the risk of the owners.*

The managers will adopt the most efficient measures for the protection of property, but in no case is it to be considered at the risk of the Institute.

8. Exhibitors, whose articles are in glass cases, are requested to leave with the clerk the keys, numbered to correspond with the entry, on or before Wednesday, the 2d of September, to enable the judges to make their examination.

9. Proper order will at all times be preserved by an efficient police, who will be present to prevent offences against exhibitors and visitors.

10. Camphene, spirit gas, burning fluid, benzine, petroleum oil, friction matches, gunpowder and fireworks, will not be allowed in the exhibition, and the managers reserve the right to reject any article that they may deem objectionable.

11. The Space Committee will have the entire charge of placing and arranging all articles exhibited.

In case of misunderstanding, applications must be made to them.

12. Exhibitors will not be allowed to remove their articles until the final close of the Fair.

13. The exhibition will be opened to the public on Thursday, the 3d, and will close on Wednesday, the 23d of September.

Tickets of admission, 25 cents; children, under 12 years of age, 10 cents.

The hours of exhibition will be from 9 o'clock A. M., until 10 o'clock P. M.

Form of Application for Space.

Article.	Name of exhibitor.	Residence.	Space required.

It is to be regretted that steam power could not be used in the building, this point was strenuously urged by the committee, but the proprietors of the building would not permit of its use, and they were reluctantly obliged to submit to their decision. All former experience has shown that moving machinery is one of the great attractions of our exhibitions.

Existing arrangements for the use of the building made it obligatory upon the Managers to open the Fair somewhat earlier than they deemed advisable, and the Managers regret that they were obliged to close the Exhibition at the time when the public evinced the greatest interest in it.

After the first announcement by the Board of Managers, it was soon discovered that many artizans who have contributed to former exhibitions, were so pressed with private engagements, that they were prevented from making their usual contributions, notwithstanding there were many novelties that attracted unusual attention.

Among these we notice the following:

Harrison's and Schnitzer's globe lenses.

Walker's sea-going monitor.

McDougall's naval battery.

Simonson's models of naval architecture.

Wheeler & Wilson's new buttonhole machine.

Agricultural machinery and implements in great variety, from Messrs. John Vanderbilt, E. H. Reeves and R. H. Allen & Co.

Specimens of electro metallurgy.

Improved cotton gin, from the Southern Cotton Gin Co.

Machinery for dressing flax and hemp, by Messrs. Sanford & Mallory.

Sewing machines, morticing, tenoning and dovetailing machines.

Type setting and distributing machines, by John F. Trow.

Clark's hatters' conformetors and conforming machines.

Improved platform scales, from the Sampson & Tibbits' Scale Co.

A splendid display of presentation swords and regimental colors, from Messrs. Tiffany & Co.

The opening address was delivered on Thursday, the 3d day of September, by Gen. Wm. H. Anthon, of this city, which was listened to with marked attention.

During the last week of the Fair, the Horticultural Exhibition took place, and we are gratified to say it was a perfect success, there being over 2000 plates of fruit on exhibition. Messrs. Ellwanger and Barry, of Rochester, N. Y., contributed 167 varieties of pears, 105 varieties of apples, 32 varieties of plums, and 6 varieties of nectarines. Mr. T. T. Lyon, Plymouth, Michigan, exhibited 147 varieties of apples, very remarkable for their size and the beauty of the specimens; many of this collection were new, which made it of interest to fruit growers in this locality. Messrs Wm. L. Ferris and John D. Wolfe, of Throg's Neck. D. W. Coit, of Norwich, Conn., and P. T. Quinn, superintendent for Prof. Mapes, at Newark, N. J., and Chas. Downing, of Newburgh, N. Y., exhibited choice varieties of pears; Messrs. O. S. Hathaway, of Newburgh, Isaac Hicks, of North Hempstead, L. I., E. Williams, of Mount Clair, and C. H. Earl, of Newark, N. J., contributed choice varieties of apples.

Mr. C. M. Hovey, of Boston, Mass., made a superior exhibition of over 100 varieties of pears, but they arrived after the Judges had made their decision.

Messrs. Frost & Co., of Rochester, N. Y., sent in a splendid collection of over 100 varieties of pears, apples and grapes. The Committee regret that they were not received in time to be examined by the Judges.

The exhibition of grapes was very fine; they were from the following persons:

Messrs. S. F. B. Morse, Poughkeepsie, N. Y.
Francis Morris, Throg's Neck, N. Y.
Wm. C. Wilson, New York city.
Isaac Merritt, Hart's village, Dutchess county, N. Y.
Chas. Downing, Newburgh, N. Y.
B. H. Mace, " "
Henry Steele, Jersey City, N. J.

Mr. Jas. Wiggins, Weehawken, N. J., exhibited several dwarf trees, of the peach, plum and nectarine, in full bearing, which were greatly admired.

The Floral Department was represented by

Messrs. Isaac Buchanan, Astoria, L. I.
Wm. Baker, New York City.
A. B. Clark, " " "
Wm. A. Burgess, Glen Cove, L. I.
A. G. Burgess, East N. Y., L. I.
Chas. S. Pell, New York City.
Wm. H. Mitchell, Harlem, N. Y.
Peter Henderson, Jersey City, N. J.
Wm. Davison, Brooklyn, L. I.
A. C. Chamberlain, Brooklyn, L. I.
David Clarke, New York City.
S. F. B. Morse, Poughkeepsie.
Benjamin Wood, Manhasset, L. I.
Jas. E. Cavenach, Brooklyn, L. I.
Thos. Cavenach, " "

During the summer the Chairman of the Horticultural Committee, Mr. Wm. S. Carpenter, wrote to Mr. Andre Leroy, of Angiers, France, asking him to exhibit some of the best varieties of fruit grown in that country. Mr. Leroy heartily responded to the invitation, and forwarded a very superb collection of fruit, to which a prominent position was given. This exhibition attracted unusual attention among Horticulturists, as the collection contained a great number of specimens not before seen in this country.

The Premium Committee, of which Mr. George Timpson was Chairman, discharged the duty with the strictest impartiality, competent judges were appointed, and upon whose reports the premiums were awarded, they were announced on the afternoon of Friday, the 26th of September, by Dr. John B. Rich, who had been appointed for this purpose. From the small number of complaints made, it is presumed that the awards were satisfactory to the exhibitors. They were as follows:

LIST OF PREMIUMS Awarded by the Managers of the Thirty-Fifth Annual Fair of the American Institue, 1863.

HORTICULTURAL DEPARTMENT.

FRUIT.

Judges.—Peter B. Mead, Isaac Buchanan, Gabriel Marc, Wm. Chorlton.

T. T. Lyons, Plymouth, Mich., for the best collection of apples	Gold Medal.
O. S. Hathaway, Newburgh, N. Y., for the best thirty named varieties of table apples	Silver cup, $10
T. T. Lyons, Plymouth, Mich., for the second best thirty named varieties of table apples	Silver Medal.
C. H. Earl, Newark, N. J., for the best twelve named varieties of table apples	Silver Medal.
T. T. Lyons, Plymouth, Mich., for the second best twelve named varieties of table apples	Bronze Medal.
E. Williams, Mont Clair, N. J., for the best twelve table apples	Bronze Medal.
C. H. Earl, Newark, N. J., for the second best twelve table apples	Book Premium.
Wm. L. Ferris, Throg's Neck, N. Y., for the best collection of pears	Gold Medal.
Charles Downing, Newburgh, N. Y., for the second best collection of pears	Silver Medal.
John D. Wolfe, Throg's Neck, N. Y., for the best thirty named varieties of pears	Silver cup, $15
Daniel W. Coit, Norwich, Conn., for the best twelve named varieties of pears	Silver cup, $10
P. T. Quinn, Newark, N. J., (Superintendent for Jas. J. Mapes, for twelve named varieties of pears,	Silver cup, $10
E. Wiliams, Mont Clair, N. J., for the best six named varieties of pears	Silver Medal.
Isaac Merritt, Hart's Village, N. Y., for the best collection of native grapes	Silver cup, $10
Charles Downing, Newburgh, N. Y., for the second best collection of native grapes	Silver Medal.
B. H. Mace, Newburgh, N. Y., for the best dish of grapes	Silver Medal.
Henry Steele, Jersey city, N. J., for the second best dish of grapes	Book Premium.
S. F. B. Morse, Poughkeepsie, N. Y., (Thos. Devoy, gardener,) for the best hot-house grapes	Silver cup, $10
Wm. C. Wilson, 43 W. 14th street, N. Y., for the second best hot-house grapes	Silver Medal.
S. F. B. Morse, Poughkeepsie, N. Y., (Thos. Devoy, gardener,) for the best muskmelons	Book Premium.

S. F. B. Morse, Poughkeepsie, N. Y., (Thos. Devoy, gardener,) for the best water melons	Book Premium.

Discretionary.

Ellwanger & Barry, Rochester, N. Y., for the best general collection of fruit	Gold Medal.
Isaac Hicks, N. Hempstead, L. I., for thirty varieties of apples	Silver Medal.
James Wiggins, Weehawken, N. J., for peach trees in pots	Silver Medal.
Hovey & Co., Boston, Mass., for a large collection of pears, (100 varieties,) too late for competition	Silver cup, $10
Francis Morris, Throg's Neck, N. Y., (James McMillan, gardener,) for a display of hot-house grapes, 10 varieties	Silver Medal.
Miss Anne Newberry, 275 Fulton street, Brooklyn, for a series of oil paintings representing fruit in season	Silver Medal.
Mrs. Prager, 21 W. 11th street, for a case of preserved flowers	Diploma.
H. W. Crittenden, Bronxville, N. Y., for superior specimens of honey	Diploma.

WINE AND BRANDY,

Judges.—Peter B. Mead, Isaac Buchanan, Gabriel Marc, Wm. Chorlton.

Sainsevain Bros., San Francisco, Cal., (Cesar A. Robert, agent, 57 Cedar street,) for the best wine, (Angelica)	Silver Medal.
Jas. C. Provoost, Greenpoint, L. I., for the best brandy	Diploma.

PLANTS AND FLOWERS,

Judges.—Robert Reid, Robert Alexander, James Fleming.

Isaac Buchanan, Astoria, N. Y., for the best collection of miscellaneous house plants	Silver Plate, $25
Wm. Baker, corner 42d street and Second avenue, N. Y., for the second best collection of miscellaneous house plants	Silver cup, $10
Isaac Buchanan, Astoria, N. Y., for the best six variegated leaved plants	Silver Medal.
A. B. Clark, Park avenue, between 36th and 37th streets, for the second best six variegated-leaved plants	Book Premium.
Isaac Buchanan, Astoria, N. Y., for the best single specimen plant	Bronze Medal.
Isaac Buchanan, Astoria, N. Y., for the best collection of orchids	Silver cup, $10
Wm. Baker, corner 42d street and Second Avenue, for the second best collection of orchids	Silver Medal.

Wm. A. Burgess, Glen Cove, L. I., for the best collection of cut flowers	Silver cup, $10
Joseph E. Cavenach, corner Washington and Greene Avenues, Brooklyn, for best basket of flowers	Silver Medal.
A. G. Burgess, East New York, L. I., for the best display of dahlias	Silver cup, $10
C. S. Pell, 74th street and Broadway, for the second best display of dahlias	Silver Medal.
A. G. Burgess, East New York, L. I., for the best 12 named dahlias	Silver Medal.
Wm. H. Mitchell, Harlem, N. Y., for the second best twelve named dahlias	Book Premium.
Isaac Buchanan, Astoria, L. I., for the best hybrid gladiolus (twenty-five varieties)	Silver Medal.
Peter Henderson, Jersey City, N. J., for the best collection of verbenas and seedling verbenas	Silver Medal.
Peter Henderson, Jersey City, N. J., for the best collection of petunias	Silver Medal.
A. C. Chamberlain, corner De Kalb Avenue and Ryerson street, Brooklyn, for the best hanging basket of plants in bloom	Silver Medal.
David Clarke, 643 Broadway, for the best hanging basket of ornamental plants	Silver Medal.

Discretionary.

Wm. Davison, Brooklyn, N. Y., for a collection of verbenas	Silver Medal.
S. F. B. Morse, Poughkeepsie, N. Y. (Thomas Devoy, gardener), for variegated-leaved plants	Book Premium.
David Clarke, 643 Broadway, for rustic stands	Diploma.
S. F. B. Morse, Poughkeepsie, N, Y. (Thomas Devoy, gardener), for ferns and lycopodiums	Diploma.
Benjamin Wood, Manhasset, L. I., for a temple of flowers	Silver Medal.

VEGETABLES.

Judges.—George Thurber, Patrick T. Quinn, George Clapp.

S. F. B. Morse, Poughkeepsie, N. Y. (Thomas Devoy, gardener), for the best collection of culinary vegetables	Silver cup, $10
S. F. B. Morse, Poughkeepsie, N. Y. (Thomas Devoy, gardener), for the best collection of potatoes	Silver Medal.
E. Williams, Mont Clair, N. J., for the second best collection of potatoes (sixteen varieties	Book Premium.
E. Williams, Mont Clair, N. J., for the best twelve ears of sweet corn	Book Premium.
S. F. B. Morse, Poughkeepsie, N. Y, (Thos. Devoy, gardener), for the best table squash	Book Premium.
S. F. B. Morse, Poughkeepsie, N. Y. (Thos. Devoy, gardener), for the largest squash	Book Premium.

D. A. Bulkeley, Williamstown, Mass., for three varieties of seedling potatoes. (A Silver Medal having been before awarded)	Diploma.

Discretionary.

Justus Slater, Jersey City, N. J., for specimens of red and yellow California tomatoes	Diploma.

MECHANICAL DEPARTMENT.

Agricultural Implements.

Judges.—S. B. Conover, Thos. Haight.

John Vanderbilt, 23 Fulton street, for a collection of agricultural implements	Silver Medal.
E. H. Reeves & Co., 185 Water street, for a collection of agricultural implements	Silver Medal.
R. H. Allen & Co., 191 Water street, for a collection of Ploughs	Silver Medal.
S. S. Hickok, Marlboro', Monmouth Co., N. J., for the best potato digger	Bronze Medal.
E. H. Bennett, 42 and 44 Greene street, for an easy working, compact and durable horse power	Bronze Medal.
Sanford & Mallory, Harlem R. R. Building, for the best hemp and flax dresser	Silver Medal.
John T. Foster, Wayne street, Jersey City, for a model seed sower, harrow and roller combined	Diploma.
Haines & Pell, 27 Cortlandt street, for a hay and straw cutter	Diploma.
R. H. Allen & Co., 189 Water street, for a store truck	Diploma.
L. Bolles & Co., South Oxford, Chenango Co., N. Y. for cast-steel hoes	Diploma.
A. M. Halsted, Rye, Westchester County, N. Y., for a cultivator and seed drill combined. (A Silver Medal has been awarded.)	Diploma.
Miles Manufacturing Company, 328 E. 12th street, for meat cutters	Diploma,
I. B. Brown & Co., Peekskill, N. Y., for a dog power	Diploma.
Fleming & Davidson, 67 Nassau street, for horticultural implements	Diploma.

Billiard Cues and Appurtenances.

Judges.—Frederick Pentz, James B. Bensel.

Phelan & Collender, Crosby Street corner Spring, for billiard cues and billiard appurtenances, perfection itself	Silver Medal.

Blank Books and Stationery.

Judges.—Benjamin Lawrence, Wm. Van Norden.

J. H. Duycknick, 164 Pearl street, for the best blank books	Diploma.

Thaddeus Davids & Co., 127 and 129 William street for sealing-wax, mucilage, ink and wafers ...... Bronze Medal.

Victor E. Manger, 115 Chamber street, for direction tags and labels, a useful article ...... Diploma.

W. H. Swartwout, 137 Broadway, for metallic paper fasteners ...... Diploma.

Boots and Shoes.

John L. Watkins, 867 Broadway, for specimens of boots and shoes ...... Diploma.

Building Materials.

Judges.—Charles T. Bunting, John M. Dodd, Wyllis Blackstone.

W. J. Fryer, Jr., Albany, N. Y., for the best chimney flues made of stoneware ...... Bronze Medal.

Wm. Osmond, 92 First Avenue, for an improved sand screen ...... Diploma.

A. Derrom, Paterson, N. J., for a sectional portable building ...... Bronze Medal.

A. M. Cochrane, 442 W. 35th street, for an iron window-blind fastening, simple and useful. (A Bronze Medal having been before awarded.) ...... Diploma.

A. Klaber, 109 E. 13th street, for a marble mantel-piece ...... Diploma.

Burial Cases, etc.

Judge.—John Cantrell.

A. E. Lyman, Williamsburgh, Mass., for indestructible burial cases and indicating ventilator ...... Silver Medal.

Wm. G. Lord & Co., 37 Park Row, for the best bier for burying the dead (Fitzgerald's patent) ...... Bronze Medal.

Wm. G. Lord & Co., Newark, N. J., for a bier for burying the dead (Scarlett's patent) ...... Diploma.

Dentistry.

Judges.—J. C. Robins, Norman W. Kingsley, C. P. Fitch.

J. Allen & Son, 22 Bond street, for superior specimen of mounted continuous gum teeth ...... Silver Medal.

Sam'l S. White, Philadelphia, Pa., and 658 Broadway, N. Y., for the best artificial teeth ...... Silver Medal.

John D. Chevalier & Sons, 639 Broadway, for section block for rubber, the best in form, translucency, and general life-like appearance ...... Bronze Medal.

E. A. L. Roberts, 56 Bond street, for an improvement in heaters for vulcanizing ...... Bronze Medal.

J. L. McDurmut, 130 W. 25th street, for an excellent heater for vulcanizing ...... Diploma.

John D. Chevalier & Sons, 639 Broadway, for superior dental instruments ...... Bronze Medal.

John D. Chevalier & Sons, 639 Broadway, for a dentist's lathe	Diploma.
Sam'l S. White, Philadelphia, Pa., and 658 Broadway, N. Y., for the best dentist's chairs ("Perkins")	Bronze Medal.
O. F. Harris, Worcester, Mass. (S. S. White, agent. 658 Broadway), for the second best dentist chairs	Diploma.

Drugs and Chemicals.

Judges—A. H. Everett, Charles A. Seely.

Joseph Dixon & Co., Jersey City, N. J., for superior black lead crucibles. (A Gold Medal having been before awarded)	Diploma.
Joseph Dixon & Co., Jersey City, N. J., for carburet of iron stove polish. (A Bronze Medal having been before awarded)	Diploma.
Bedford Lubricating Oil Company, 56 Cortlandt st., for oil	Diploma.
A. Y. & T. Van Amringe, 209 Canal st., for emory and pumice stone	Diploma.

Engraving.

Judges.—J. C. Buttre, A. Hass.

American Bank Note Company, c. Wall and William street, for the best bank note engraving	Silver Medal.
Wm. E. Marshall, Boston, Mass., for the best portrait in line engraving	Bronze Medal.
A. H. Ritchie, 442 Broadway, for the best mixed style of engraving	Bronze Medal.
F. F. Hewett, 339 Broadway, for the best card engraving	Diploma.
T. N. Hickcox, 280 Pearl street, for stencil plates, stencil punches and steel dies	Bronze Medal.
Wm. Schaus, 749 Broadway, for beautifully carved frames	Diploma.

Fancy Articles, Needlework, Waxwork, Etc.

Judges.—Mrs. C. A. Wadsworth, Mrs. M. L. Timpson, Mrs. M. L. Adee.

J. R. Schrimshaw, 62 Dey street, for a beautiful collection of shellwork	Silver Medal.
S. P. Hendry, 51 W. Washington place, for a vase of wax flowers	Diploma,
Marie B. Wentworth, 229 E. 17th street, for a vase of wax flowers	Diploma.
Mrs. J. M. Fish, 44 E. 26th street, for specimen of waxwork and carriage robes	Diploma.
Mrs. De Wolf, 923 Broadway, for grapes and bananas modelled in wax, very meritorious	Diploma.
Mrs. S. P. Mather, 57th street near Eighth Avenue, for specimen of waxwork	Diploma.

Mrs. Husted, 32 Platt street, for wax flowers	Diploma.
Madam Demorest, 473 Broadway, for ladies' and children's system of dress cutting, ladies' corsets, braid and embroidery stamps, ornamental Tarleton dresses, needlework and embroideries, ladies' hoop skirts, patterns of ladies' and children's dresses, infant's dress paterns, for the collection	Silver Medal.
Mrs. A. S. McLean, 84 Fulton street, Brooklyn, for spring pads and corsets	Diploma.
Mrs. P. Wilson, 281 Carlton Avenue, Brooklyn, for a piece of needlework (Joseph and his Bothers")	Diploma.
Mrs. B. F. Brady, 169 Elm street, for worstedwork ("Washington crossing the Delaware")	Diploma.
M. J. Drummond, 331 Grand street, for beautiful specimens of regalias	Diploma.
Miss Caroline J. Kildare, 12 Crosby street, for embroidery in silk and gold	Diploma.
Ira Perego & Sons, 175 Broadway, for very superior shirts	Diploma.
Grover & Baker Machine Company, 495 Broadway, for beautiful specimens of machine embroidery	Diploma.
Wheeler & Wilson Sewing Machine Company, 505 Broadway, for beautiful specimens of machine braidwork	Diploma.
Wilcox & Gibbs, 508 Broadway, for machine braiding	Diploma.
The Misses O'Connell & Crawford, for beautiful specimens of sewing and braiding on Sloat's elliptic machine	Diploma.

FINE ARTS.

Judges—Leopold Eidletz, A. Haas, P. Reamey.

Frye & Co., 242 Canal street, for specimens of oil paintings	Diploma.
J. Gurney & Son, 707 Broadway, for the best photograph in oil color. (A Gold Medal having been before awarded.)	Diploma.
J. Gurney & Son, 707 Broadway, for a photograph in water color. (A Silver Medal having been before awarded.)	Diploma.

Discretionary.

Wm. J. Hanington, 833 Broadway, for specimens of stained glass. (A Gold Medal having been before awarded.)	Diploma.

FIRE ARMS.

Starr Arms Company, Yonkers, N. Y., and 267 Broadway, for revolving pistols	Silver Medal.
Elliot Arms Company, 494 Broadway, for revolving pistols. (A Bronze Medal having been before awarded.)	Diploma.

FURNITURE, SHOW-CASES, &c.

Judges—John Ash, L. F. Schaffer.

Lorenz & Core, 13 North William street, for the best show cases	Silver Medal.
J. H. Fraser, c. of Reade and Hudson street, for well made show-cases	Diploma.
John Dagnier, 39 Mercer street, for a shut-up table and chairs combined, an ingenious piece of work	Diploma.
George P. Sloat & Co., Philadelphia, Pa. (Mrs. H. G. Suplee, agent, 537 Broadway, N. Y.) for an elegant rosewood cabinet	Diploma.
Fischer & Bros., 126 McDougal street, for a black and gilt ladies' writing-table and pedestal	Diploma.
A. Eliaers, Boston, Mass., for reclining chairs	Bronze Medal.

GAS AND SODA-WATER APPARATUS.

Judges—T. D. Stetson, Jas. Wilson.

Warker & Eppstein, 133 Fourth Avenue, for a portable apparatus for generating carbonic gas for family use	Silver Medal.
G. D. Dows, 525 Washington street, Boston, for ice-cream and soda-water apparatus	Silver Medal.
John Matthews, 437 First Avenue, for a display of chaste and elegant soda-water fountains	Silver Medal.
Wm. Gee, 6 and 7 New Haven R. R. Building, for soda-water apparatus	Silver Medal.
Wm. Gee, 6 and 7 New Haven R. R. building, for a valve for drawing soda-water	Diploma.

HARDWARE, ETC.

Judges—H. A. Patterson, John C. Johnson, Walter Tufts, Jr.

H. Getty, 55 Willow street, Brooklyn, L. I., for the best pipe wrench	Bronze Medal.
H. F. Read, 55 and 57 1st street, Brooklyn, L. I., for the second-best pipe wrench	Diploma.
C. B. Rogers, Norwich, Conn., for Blondin skates	Diploma.
H. R. & J. L. Plimpton, 145 E. 10th street, for floor and ice skates	Diploma.
American Spiral Spring Hinge Company (W. H. Hayes, agent, 198 Broadway) for spiral spring hinges	Diploma.
John Russell, 189 Allen street, for a portable dressing-case	Diploma.

HOUSE FURNISHING GOODS.

Judges—John W. Onderdonk, John G. Berrian.

H. H. Casey, 600 Broadway, for an assortment of house furnishing goods	Silver Medal.
E. D. Bassford, Cooper Union Building, for an assortment of house furnishing goods	Silver Medal.

Wheeler & Wilson Sewing Machine Company, 505 Broadway, for Foote's patent umbrella lock stand	Silver Medal.
James W. Browne, 212 Broadway, for metallic weather strips	Bronze Medal.
Stephen W. Smith, 498 Broadway, for locomotive cantering horses	Bronze Medal.
L. Tibbals, 512 Broadway, for a spring hobby horse	Diploma.
D. S. Plume, 59 Duane street, for Balsley's patent step ladders	Diploma.
Vincent Fountain, jr., Staten Island, for a step and house ladder combined	Diploma.
Samuel Bissicks, 294 Bowery, for a wash and water closet, combined	Diploma.
Steele & Co., 3 Park Row, for ostrich feather dusters	Bronze Medal.
James Murtagh, 1235 Broadway, for a dumb waiter,	Bronze Medal.
E. F. Woodward, 43 Gold street, for quick-boiling kettles and combination boilers and steamers	Diploma.
John G. West, 4 Liberty Place, for a mangle	Diploma.

LAMPS AND GAS FIXTURES.

Judges.—Wm. C. Lester, William Webster, Isaiah Waterman.

Geo. A. Jones, 589 Greenwich street, for the best mechanical lamp	Silver Medal.
Savage & Co., 202 Fulton street, for the "no chimney burner" lamp	Bronze Medal.
J. E. Ambrose, 255 Pearl street, for the second best house lamp	Diploma.
J. G. Leffingwell, 102 Nassau street, for lamps with improved slides	Diploma.
J. G. Leffingwell & Co., Newark, N. J., for the best gas governor	Bronze Medal.
Sterling & Co., 505 Broadway, for a gas governor,	Diploma.
Geo. Burgess, 254 Broadway, for the best gas burners	Diploma.

MACHINERY.

Judges.—Benjamin Aycrigg, James Bogardus, Thomas B. Stillman.

Thos. H. Braisted & Bro., 212 Broadway, for a valuable improvement in hose coupling	Silver Medal.
N. Hayman, 18 Marion street, for a signal bell arrangement for steamers	Bronze Medal.
Wood & Mann, Utica, N. Y., (Hoag & Hampson, agents, 96 Maiden lane,) for a portable steam engine and boiler	Bronze Medal.
C. C. Graves, Brooklyn, for a compressor and punch, well adapted to upsetting tires	Bronze Medal,
Bernard Morahan, Brooklyn, for an exceedingly ingenious mode for stopping and starting horse cars,	Diploma.

Geo. W. Furman, 100 Walker street, for a steam engine trap	Diploma.
Chas. McIntyre, Easton, Pa., for a suspension culvert	Diploma.
H. Shlarbaum, 550 Pearl street, for a model of simple oscillating engine	Diploma.
James Christison, 305 9th street, for model of a new conical press	Diploma.
Southern Cotton Gin Co., (James E. Carver, agent, Bridgewater, Mass.,) for a hand cotton gin	Bronze Medal.
New York Quartz Co., 48 & 50 E. 26th street, for specimens of emery wheels	Diploma.
New York Belting and Packing Co., 38 Park Row, for specimens of emery wheels	Diploma.
R. Crosby, Newark, N. J., for a hand tenoning machine	Diploma.
A. Green, 126 Pearl street, for an excellent dovetailing machine	Bronze Medal.
Jos. Watson, 31 Park Row, for a simple and portable roller printing press	Diploma.
Haines & Pell, 27 Cortlandt street, for a derrick for hoisting barrels, a good arrangement for the purpose	Diploma.
Jas. M. Fish, Buffalo, N. Y., for a good arrangement for weighing and bagging grain	Diploma.
Hoag & Hampson, 96 Maiden lane, for a self-feeding hand sawing machine	Bronze Medal.
Thos. J. Wells. 104 William street, for portable circular saws	Bronze Medal.
T. R. Pickering, 163 W. 26th street, for a steam engine governor	Diploma.
Sampson & Tibbits, Scale Co., Troy, N. Y., (John Rowe, agent, 15 Dey street,) for improvement in platform scales	Silver Medal.
Talcott & Underhill, 482 Broadway, for a turbine water wheel	Diploma.
Thos. Prosser & Son, 28 Platt street, for a fine display of boiler maker's tools, and lap-welding and expanding work. (A Silver Medal having been before awarded)	Diploma.
John Turner, Norwich, Conn., for a valuable cord covering machine	Silver Medal.
John F. Trow, 50 Greene street, for an ingenious and interesting machine for setting and distributing type. (A Gold Medal having been before awarded)	Diploma.
J. H. Pomeroy & Co., Syracuse, N. Y., for improvement in valves for steam engines	Bronze Medal.
Lazell, Perkins & Co., Bridgewater, Mass., (J. S. Underhill, agent,) for an elaborate piece of forging,	Silver Medal.

E. B. Requa, 11 Dey street, for an improved windlass for hoisting	Diploma.
Warren Lyon, 87 & 89 Bank street, for a hand drilling machine	Bronze Medal.
D. Pennoyer, 23d street, for an ingenious arrangement of day and night cars	Diploma.

WASHING MACHINES AND CLOTHES WRINGERS.

Judges.—Edward Gray, Isaac Fryer.

J. Johnson & Co., 457 Broadway, for the best washing machine	Bronze Medal.
A. G. Heckrotte, 431 W. 36 street, for the second best washing machine	Diploma.
Metropolitan Washing Machine Co. (R. C. Browning, agent, 347 Broadway), for the best wringing machine	Bronze Medal.
Haley, Morse & Boyden (S. Hawes, agent, 498 Broadway), for the second best wringer	Diploma.

MATHEMATICAL AND PHILOSOPHICAL INSTRUMENTS.

Judges.—Alexander J. Cotheal, Thos. C. Avery, P. H. Vanderweyde, Joseph Gall.

Harrison & Schnitzer (manufactured by Nelson Wright), 458 Broadway, for globular lenses	Gold Medal.
August Haas, 567 Sixth avenue, for the best electrotypes	Gold Medal.
E. Kendall, New Lebanon Spa, for aneroid barometers	Bronze Medal.
G. Tagliabue, 298 Pearl street, for superior barometers. (Silver Medal having been before awarded)	Diploma.
Jerome Kidder, 545 Broadway, for the best electro magnetic machines	Diploma.
Samuel Clark, 219 Centre street, for hatters' conformeters	Silver Medal.
B. H. Horn, 212 Broadway, for model of a steam engine	Diploma.
John Matthews, 437 First avenue, for electro-metallurgical deposits	Silver Medal.
E. Holmes, 252 Broadway, for a burglar or house alarm telegraph	Bronze Medal.
Jerome Kidder, 545 Broadway, for galvanic insoles	Diploma.
The London Stereoscopic Co., 579 Broadway (Jas. L. Warner, manager), for exhibition of stereoscopes and views	Bronze Medal.

MILLINERY.

Judges.—Miss Louisa De Voe, Mrs. M. Van Buren, Mrs. S. Harington.

Isaac Binns, 309 Hudson street, for the best millinery	Bronze Medal.

Mrs. A. A. Binns, 551 Broadway, for the second best millinery	Diploma.
Mrs. Wm. Simmons, 637 Broadway, for specimens of millinery	Diploma.

NAVAL ARCHITECTURE.

Judges.—Jos. J. Comstock, Jacob A. Westervelt, Jas. Bogardus.

Augustus Walker, Buffalo, N. Y., for a model of a sea-going monitor	Silver Medal.
R. G. McDougall, 96 Maiden Lane, for a model of a floating battery for harbor defence	Bronze Medal.
Jeremiah Simonson, Greenpoint, L. I., for five models of naval architecture	Silver Medal.
John Englison, foot of 10th street, E. R., for a model of U. S. Revenue Cutter "Asheulot"	Bronze Medal.
E. T. Darling, Port Jefferson, N. Y., for a model of a yacht	Diploma.
W. H. & J. S. Darling, 371 South street, for a pleasure barge	Bronze Medal.

Discretionary.

J. D. Benton, Wilmington, Del., for the exhibition of the gold Monitor	Silver Medal.

ORGANS AND TRIOLODEONS.

Judges.—A. H. Wood, Clare W. Beames.

Mason & Hamlin, Boston, Mass. (Mason Brothers, agents, 5 Mercer street), for the best cabinet organs. (Silver Medal having been before awarded)	Diploma.
M. Dücker, 19 W. Houston street, for a superior triolodeon. (A Large Silver Medal having been before awarded)	Diploma.

PENMANSHIP.

Judges.—Lewis H. Embree, Giles H. Coggeshall, J. H. Barlow.

Mrs. E. M. Bassett, New York, for a specimen of penmanship	Diploma.
John D. Williams, Bryant & Stratton College, Cooper Union, for the best off-hand and business penmanship	Silver Medal.
B. F. Brady, 169 Elm street, for superior specimens of ornamental penmanship	Silver Medal.
H. Greiling, 56 Myrtle Avenue, Brooklyn, for beauty of design and execution of a piece of penmanship	Diploma.

PHOTOGRAPHS.

Judges.—Samuel H. Maynard, Lewis M. Rutherford.

J. Gurney & Son, 707 Broadway, for the best cartes de visite and retouched photographs in India ink	Silver Medal.

C. D. Fredericks & Co., 587 Broadway, for the second best cartes de visite and retouched photographs in India ink	Bronze Medal.
American Phototype Co., 2 Leroy street, for phototypes and the best untouched photographs	Silver Medal.
C. D. Fredricks & Co., 587 Broadway, for four character pictures ("Oscanyan")	Silver Medal.

Preparations of Natural History.

John G. Bell, 339 Broadway, for the best case of preserved birds, for beauty, variety and workship	Silver Medal.

Piano Fortes.

Judges.—L. M. Gottschalk, Albert W. Berg, Clare W. Beames.

Wm. B. Bradbury, 427 Broome street, for the best piano forte	Gold Medal.
J. B. Peck, 252 Ninth Avenue, for the second best piano forte	Silver Medal.
M. Dücker, 19 W. Houston street, for a grand piano forte	Bronze Medal.
E. H. Hase, 95 W. 32d street, for an upright Piccolo piano forte	Bronze Medal.
Mathushek & Kühner, exhibited by Bristow & Hardenbrook, 765 Broadway, for piano of new and elegant shape	Bronze Medal.

Pumps, Gauges, etc.

Judges.—John Powers, John T. Foster.

Wm. Sewell, for the best steam pump, hand pump and hand fire engine combined, manufactured by Sewell & Cameron, corner Second Avenue and 22d street	Silver Medal.
Brinckerhoff & Springsteen, 427 and 429 Tenth st. for the best hand force pump. Tower's Patent	Bronze Medal.
J. D. West, 179 Broadway, for the second best hand force pump	Diploma.
J. C. Cary, 2 Astor House, for the best rotary power pump. (A Gold Medal having been before awarded.)	Diploma.
Hart & Co., Utica, N. Y., for the second best rotary pump	Bronze Medal.
R. H. Allen & Co., 189 and 191 Water street, for a cephydrian	Diploma.
Abner Van Horn, 624 5th street, for the best steam valves	Bronze Medal.
H. Q. Hawley, Albany, for Aubin's water meter. (A Gold Medal having been before awarded.)	Diploma.

REFRIGERATORS AND WATER COOLERS.

Lesley & Elliot, 494 Broadway, for the best refrigerator. (A Silver Medal having been before awarded.)	Diploma.
Lesley & Elliot, 494 Broadway, for a polar water cooler	Diploma.

SADDLERY.

Peck Brothers, 61 Chambers street, for an improvment in saddles	Bronze Medal.

SEWING MACHINES.

Judges.—Thos. C. Avery, Jas. Bogardus, Saml. Gardiner, Jr.

Wheeler & Wilson Manufacturing Co., 505 Broadway, for the best double threaded sewing machine, being the most perfect and simple in its construction, and working parts. (A Gold Medal having been before awarded.)	Diploma.
Sloat Eliptic Sewing Machine (Mrs. A. H. Suplee, agent, 537 Broadway), for the second best sewing machine	Silver Medal.
Wilcox & Gibbs, 508 Broadway, for the best single threaded sewing machine, for stillness of its running and perfection of its work	Gold Medal.
Wheeler & Wilson Manufacturing Co., 505 Broadway. for a buttonhole machine, for novelty and perfection of its work	Gold Medal.
Madame Demorest, 473 Broadway, for a valuable tucking attachment to sewing machines	Silver Medal.
Madame Demorest, 473 Broadway, for a running stitch sewing machine	Diploma.
Daniel Barnum, 130 W. 25th street, for a self-sewer	Diploma.

SIGN PAINTING, GRAINING, SHOW CARDS, ETC.

Judges.—John C. McRae, Edward Walker.

Chromo Fulgent Print Co., 156 William street (Wm. Truslow, agent), for gelatined pictures and show cards	Silver Medal.
Albert B. Waldron, 155 and 157 Broadway, for medallion show cards	Diploma.
Ashe, Dayton, & Co., 159 and 161 Mercer street, for an excellent sign	Diploma.
Cyrus Griffith, 49 E. 12th street, for sign painting and gilding on glass	Diploma.
Barney & Stiles, 40 Hudson street, for lettering on glass	Bronze Medal.
E. Y. Clark, 278 Spring street, for lettering on wire shade	Bronze Medal.
A. Warneson, 416 Sixth Avenue, for metallic signs	Bronze Medal.

Stewart S. Bannon, 148 E. 36th street, for specimen of graining	Diploma.

SEWING SILK, TWINE AND CORD.

M. Hemingway & Sons, Watertown, Conn. (S. J. Dennis, agent, 78 Reade street), for superior sewing silk. (A Silver Medal having been before awarded.)	Diploma.
John Turner, Norwich, Conn., for an assortment of fishing lines, satin finish fancy twines and machine-made picture cord	Bronze Medal.

SILVER-PLATED WARE.

Judges—John W. Onderdonk, John G. Berrian.

Hiram Young, 20 John street, for the best silver-plated ware	Silver Medal.
E. D. Bassford, Cooper Union, for the second-best silver-plated ware	Bronze Medal.

STOVES, RANGES AND FURNACES.

Judges—B. F. Miller, Elijah Brady.

Bramhall, Deane & Co., 268 Canal street, for the best hotel range	Silver Medal.
William Pettit, 351 W. 35th street, for the second-best cooking range	Diploma.
E. Moneuse & Duparquet, 30 Greene street, for cooking ranges and fixtures	Bronze Medal.
Jas. C. Merritt, 1212 Broadway, for a laundry range	Diploma.
C. W. Spaulding, 11 Bible House, for the best fireplace heater	Silver Medal.
Wm. C. Lester, 1279 Broadway, for the second-best fireplace heater	Bronze Medal.
Thorp & Budd, 184 W. 14th street, for a fireplace heater	Diploma.
Pettit & Ray, 437 Fulton Avenue, Brooklyn, for Stafford's fireplace heater	Diploma.
E. Andrews, Albany, N. Y., for the best gas burning apparatus	Silver Medal.
S. T. McDougall, 474 Broadway, for gas heaters and cooking apparatus	Bronze Medal.
Wm. D. Russell, 206 Pearl street, for the best lamp heaters adapted to various purposes. (A silver medal having been before awarded)	Diploma.
Baker & Smith, 182 Centre street, for a steam radiator—a good specimen of workmanship	Diploma.
Lesley & Elliot, 494 Broadway, for the gothic furnace	Diploma.
M. J. Frisbie, 24 W. 15th street, for Delano's patent coal burner, a valuable invention to feed coal at the bottom instead of the top of the fire	Silver Medal.

Swords.

Tiffany & Co., 550 Broadway, for an excellent display of swords, and a stand of colors, beautifully embroidered	Silver Medal.

Surgical Appliances and Artificial Teeth.

Judges—John Osborn, M. D., Lewis A. Sayre, M. D., A. K. Gardner, M. D., G. Miliano, M. D.

Wm. Selpho, 516 Broadway, for the best artificial limbs	Silver Medal.
J. W. Weston, 491 Broadway, for metallic corrugated legs	Bronze Medal.
Marsh & Co., 2 Vesey street, for supporters and surgical appliances. (A silver Medal having been before awarded.)	Diploma.
Marsh & Co., 2 Vesey street, for an instrument for the purpose of extending the leg or thigh	Bronze Medal.
Mattson Syringe Co., New York (Haggerty, Bros., agents, 8 and 10 Platt street,) for Mattson's syringes	Diploma.

Tin-Lined Lead Pipe.

Willard & Shaw, 63 and 65 Centre street, for tin-lined lead pipe	Silver Medal.

Upholstery.

Judges—James Jackson, Thos. H. Cooper.

Isaac E. Palmer, Montville, Conn., for the best mosquito net fixtures	Diploma.
Scott, Beebe & Grenell, 91 W. 30th street, for the best spring bed	Diploma.
H. W. Henley, 134 W. 36th street, for a ventilating mattress and bedstead	Diploma.

Miscellaneous.

Lewis A. Osborn, 69 Warren street, for prepared coffee	Diploma.
John P. Lyon, 132 Chatham street, for caloric pressed rye coffee	Diploma.
Thomas M. Redhead, 66 Fulton street, Brooklyn, for baking and pastry powders	Diploma.
Thos. Andrews & Co., 136 and 138 Cedar street, for saleratus and yeast powders	Diploma.
H. A. Downing & Co., 111 E. 18th street, for concentrated food	Diploma.
B. F. Miller, 41 Greenwich street, for patent baking pans	Diploma.
John L. Rowe, 409 Ninth Avenue, for police clubs	Diploma.
Alex. Burns, 294 Front street, for a harness cask	Bronze Medal.
Pollak & Son, 357 Broome street, for meershaum pipes and holders	Diploma.

S. J. Pardessus, 32 Platt street, for perfect specimens of glass shades	Bronze Medal.
Ridgewood Manufacturing Co., 429 Broadway (R. E. Dixon & Co., proprietors), for Ridgewood pipe and tobacco cases	Diploma.
James Morton, Scotch Bakery, 125 Court street, Brooklyn, for fancy crackers	Diploma.
R. K. McCullough, 922 Broadway, for an ornamental cake	Diploma.
Martin, Runyon & Co., 299 Broadway, for walking dolls, novel and ingenious	Bronze Medal.
John N. Stearns, 60 Cedar street, for a beautiful display of flags	Bronze Medal.
John L. Salisbury, 159 Duane street, for a display of flags	Diploma.
Geo. R. Bond, 65 Orchard street, for tokens of the rebellion—a large collection and well designed	Diploma.
Thos. J. Dunkin, 189 E. 19th street, for the "Asclepias Syriaca," or milk weed combined with cotton, silk or wool—destined to be a very useful discovery	Bronze Medal.
A. D. Frye, 242 Canal street, for sectional vault lights	Bronze Medal.
Geo. W. Robertson, 489 Broadway, for Davis's operating swing	Diploma.
English & Messick, New Haven, Conn., for folding chairs	Diploma.
Fred. Kaiffer, 249 W. 35th street, for a beautiful specimen of carving	Diploma.
New York Belting and Packing Co., 38 Park Row, for India rubber machine belting. (A Silver Medal having been before awarded)	Diploma.
Frye & Co., 242 Canal street, for very superior glass paper weights	Diploma.
Macomb Stone Co., Macomb, Ill., for a grindstone	Diploma.
Wm. Shaw, Hudson, N. Y., for a sash lock and supporter	Diploma.
Mrs. Henrietta Adams, for a hair crimper or waver, and lamp for heating the same	Diploma.
F. G. Ford, 173 Bleecker street, for a method of securing the stop beads of window frames with springs	Diploma.

TOTAL.—8 Gold Medals; 13 Silver Cups; 73 Silver Medals; 66 Bronze Medals; 149 Diplomas; 11 Volumes of Books.

The Finance Committee, of which Mr. Geo. Peyton was chairman, performed the responsible duty to which it was entrusted with great satisfaction to the Board of Managers.

The following is a condensed statement of the receipts and expenditures of the Fair.

RECEIPTS.

From sales of tickets		Thursday,	September	3, 1863		$65 00
do	do	Friday,	do	4, do		103 00
do	do	Saturday,	do	5, do		150 00
do	do	Monday,	do	7, do		180 00
do	do	Tuesday,	do	8, do		215 00
do	do	Wednesday,	do	9, do		250 00
do	do	Thursday,	do	10, do		300 00
do	do	Friday,	do	11, do		257 00
do	do	Saturday,	do	12, do		275 00
do	do	Monday	do	14, do		225 00
do	do	Tuesday,	do	15, do		300 00
do	do	Wednesday,	do	16, do		380 00
do	do	Thursday,	do	17, do		450 00
do	do	Friday,	do	18, do		311 00
do	do	Saturday,	do	19, do		175 00
do	do	Monday,	do	21, do		400 00
do	do	Tuesday,	do	22, do		500 00
do	do	Wednesday,	do	23, do		490 00
do	do	Thursday,	do	24, do		570 00
do	do	Friday,	do	25, do		280 30
do	do	15 and 20 cents				32 20
Total receipts from tickets						$5,908 50
From rent of saloon and stands						272 00
						$6,180 50
Am't appropriated by the Inst. Aug, 6, 1863,					$1,800 00	
Less prepaid the treasurer Nov. 7, 1863,					1,404 63	
						395 00
Amount to be accounted for						$6,575 87

EXPENDITURES.

By Committee on Location.			
Rent of the Academy of Music,	$3,600 00		
Extra time	150 00		
		$3,750 00	
By Committee on Finance.			
Ticket sellers		85 00	
By Ticket Committee.			
Ticket receivers		95 00	
By Com. on carpenters' work and reception of goods.			
Carpenters' work	$146 22		
Lumber	79 52		
Carried forward	$225 74	$3,930 00	$6,575 87

Brought forward	$225 74	$3,930 00	$6,575 87
Muslin and paper for tables	34 41		
Cartage and labor rem'g lumber,	28 50		
Floor clerks	193 33		
Cleaning	27 68		
Insurance on gold Monitor	13 50		
Incidental expenses	33 61		
		556,77	
Office clerks		78,66	
By Committee on Flags.			
Banners and putting up	$98 36		
Muslin for flags for cars,	70 47		
		168 83	
By Police Committee.			
Night watch		106 00	
By Committee on Light.			
Gas on account	69 50		
Use of chandeliers, &c	37 00		
		106 50	
By Committee on Music.			
Music		707 00	
By Printing & Publication Com.			
Printing	$236 85		
Advertising	406 58		
Stationery, entry books & badges	61 55		
Postage stamps	39 81		
Posting bills.	18 80		
		763 59	
By Committee on Horticulture.			
Labor	$32 49		
Use of crockery and glass	40 00		
Freight & expenses fruit from France	29 94		
Freight and cartage	6 40		
		108 83	
By Committee on Stands.			
Refreshments for managers and committees.		49 69	
			6,575 87
Outstanding Claims.			
Gas Light		$486 00	
Lanterns and feather dusters		4 88	
Postage Stamps for premium lists		2 00	
Premiums.			
Gold & silver for premiums	$451 65		
Silver cups and silver ware	125 06		
Striking medals	138 63		
	$715 34	$492 88	

Brought forward	$715 34	$492 88	$6,575 87
Engraving premiums	83 50		
Medal cases	50 00		
Paper for diplomas	20 00		
Printing	30 00		
Filling up	29 40		
Books and expenses	13 00		
Printing lists of awards	21 25		
		962 49	
			1,455 37

The total cost of the Exhibition was	$8,031 24
Deduct receipts as before stated	6,180 50
	$1,850 74
Amount to be received from the State	950 00
Leaving a balance against the Fair of	$900 74

When it is taken into account that the members of the Institute, with their families, had the privilege of attending the Fair every day it was open by the public, and the amount received for new members admitted and arrears of dues from members paid at the Fair, which together amounted to $627, a great part of which might not have been collected; it will be seen that the loss on the Exhibition is but trifling compared with the benefits it has conferred.

In conclusion the managers would respectfully but earnestly urge upon the Institute the importance of securing a location upon which a suitable building could be erected for the purpose of holding the Annual Exhibitions. The cost annually incurred in the erection of the necessary machinery and fixtures for an Exhibition, occupying at most three or four weeks, is very large, and at the close, these fixtures have to be taken down and stored, or if sold the sum realized is but a small proportion of their cost.

All of which is respectfully submitted.

WILLIAM H. BUTLER,
WM. S. CARPENTER,
JAMES C. BALDWIN,
WILLIAM EBBITT,
THOMAS F. DE VOE,
JOHN V. BROWER,
GEORGE TIMPSON,
ANDREW BRIDGEMAN,
JOHN B. PECK,
GEORGE PEYTON,
JAMES KNIGHT,
WILLIAM COTHEAL,

HENRY STEELE,
GEO. M. WOODWARD,
GEORGE R. JACKSON,
JAMES R. SMITH,
CLARKSON CROLIUS,
JOHN G. BERGEN,
J. S. UNDERHILL,
WARREN ROWELL,
J. GROSHON HERRIOT,
J. OWEN ROUSE,
WILLIAM WEST,
JOHN B. RICH, *Managers.*

JOHN W. CHAMBERS, *Secretary.*

NEW YORK, *February* 3, 1864.

ADDRESS

BY GENERAL WM. H. ANTHON, AT THE OPENING OF THE THIRTY-FIFTH ANNUAL FAIR OF THE AMERICAN INSTITUTE, SEPTEMBER 3, 1863.

Ladies and Gentlemen:—This occasion is a joyful one; the people of New York have always hailed with pleasure the annual occurrence of this grand festival of American industry, pleasure which is increased on the present occasion by the reflection that the perils surrounding our beloved country, which for two years have caused the postponement of this beautiful exhibition are now fast passing away. May they continue to pass away! May they vanish like the clouds of the night before the rising sun! and may power, tempered by magnanimity and forbearance, speedily restore to us a stronger Union, based not upon constitutional laws alone, but upon mutual confidence, good will and respect. We miss familiar faces in these halls, we miss the varied productions of the industry of a large portion of our country, and we look with hopeful anticipations to the time when those who under the counsels of wicked and designing men have been led to the stern rivalry of arms shall, at the invitation of a mild and paternal government, cast those arms away and be content henceforth to vie with us only in the arts of peace. So short a time has elapsed since the Board of Managers have completed their arrangements, and so many new and beautiful articles are even now being added to this exhibition, that I can do but little more than ask this refined and intelligent audience to examine for themselves, and note the rapid progress which the useful and ornamental arts have been making among us, even in the midst of this gigantic war. It would be impossible for me to direct your attention among so many things which are worthy of praise, to those which are particularly admirable, but you will soon perceive that vast improvements have been made in the manufacture of many articles of utility, and that a new impetus seems to have been given to the development of American Industry. This fact must, at the present time, be most gratifying to every reflecting mind, for not a few of the enemies of Republican Institutions have prophesied that the effect of the great political convulsion through which we are passing would be, to paralyze the arm of industry and cause a retrograde movement, from which we would not for many years recover. Thank God! such prophecies are proved to be false, and this exhibition conclusively shows that the arm of industry is not paralyzed or broken, and that in consequence of the due subordination of the military to the civil power, even in the midst of war, progress marks our course in all the arts of peace. In this point of view the present exhibition has, indeed, great significance, and we may well pause to reflect upon the mighty lesson which it teaches. Great armies and fleets are deemed by many the surest proofs of national strength, but in most cases they will be found to be the unfailing evidence of weakness and impending ruin. They tell of a people bowed to the earth by the heavy weight of taxation, of manufactures suspended, of commerce ruined. An exhibition like the present, on the other hand, conveys the surest evidence of national prosperity and capacity to support whatever military force the exigencies of the times may require. They err greatly who estimate the power of nations by the number of armed men whom their people are compelled to support, rather than by the intelligence and capacity of their laboring class, for it is in the workshop and fields that the true sources of power exist which the battalion and the squadron merely consume. I say that the power of a nation is in its industrial classes, and it is on this account that the civil authority, in all well-regulated governments, takes precedence of military rule.

Look around this hall upon all the useful articles with which the tables are covered, and tell me whether the great armies and navies which carry the flag of the Republic so proudly, could be maintained for an hour in the absence of the patient industry by which those articles were produced. Precisely in the same ratio in which agriculture and manufactures prosper in a country, is the capacity of that country to support the burden of war. The plow must turn the furrow, and the farmer must garner the rich harvest of the golden grain, or the hungry soldier will faint with weakness; the noisy shuttle must traverse the loom, and the silent needle in woman's hand must perform its busy work, or he will be chilled by the storms and blasts of winter; the blazing forge must glow, and the sonorous anvil ring to furnish him with arms to meet his adversaries. This exhibition, therefore, which displays the progress of American industry, displays at the same time the true sources from which the power of the Republic springs, and prompts us by every means at our command to extend and improve them. Upon the maintenance of the civil authority in its full integrity, unrestricted and unimpaired, the harmonious working of the great and intricate system of human industry mainly depends; it is so nicely adapted by the experience of years to the relative positions and necessities of all classes of society, that any sudden change or any interference of the military power, however slight it may apparently be, disturbs and deranges to a greater or less extent the entire system. The soldier's arm receives its strength from the civil authority, of which it is the servant; it should never attempt to control that which creates and sustains it. On this account it is that the plumed hat is doffed, and the point of the sabre lowered in the presence of the civil magistracy as the representative of that power by which armies and navies are maintained, and on this account the exhibition before us, with its varied treasures of mechanical art, is a higher and more convincing proof of the power of the Republic than its armies girt with bristling steel from the Potomac to the Mississippi, and all its iron clad navies which ride the waves. It is the great object of this Institute to encourage American industry, and in this point of view its work is truly national, and its benefits in times past have been generally and widely disseminated; it is in every sense the friend of the laboring man, whether that labor is exerted in the scholar's study, in the noisy workshop, among the furrows of the teeming meadow, or in the mines down in the depths of the earth. The Institute has encouraged rising merit; it has brought into notice many useful inventions, and tended in no small degree to elevate the character and increase the knowledge of the American mechanic. It lacks but one thing, in my judgment, to complete and render most efficient its arrangements for practical usefulness, namely, a permanent location where an extensive library and a mechanical museum may be at all times maintained. It seems somewhat strange, indeed, that in a city so noted for magnificence and costliness of its public institutions, the claims of the Institute for a permanent foundation should not have commended themselves to the liberality of private individuals if not to that of the corporate authority; but with the return of peace and union re-established, the American Institute will enter upon a career of prosperity which will cause it to be remembered in future years as one of the most important and useful societies of the age. It has encouraged the arts of peace and developed the resources of war, and now, like all our other great interests, both public and private, it needs but the influence of a vigorous prosecution of the war, followed by an honorable and magnanimous settlement of our pending difficulties, to establish it in a position of wide-spread usefulness. In the name of the President, the Board of Managers and the officers of the Institute, I welcome this refined and intelligent audience to these halls lately sacred to song, but now for a brief period devoted to the interests of American industry.

ANNIVERSARY ADDRESS

BEFORE THE AMERICAN INSTITUTE, "ON THE ORIGIN AND HISTORY OF INSTITUTIONS FOR THE PROMOTION OF THE USEFUL ARTS," DELIVERED AT THE HALL OF THE NEW YORK HISTORICAL SOCIETY, ON THE 11th OF NOVEMBER, 1863, BY CHARLES P. DALY, LL.D.

Gentlemen of the Institute :

Having accepted your invitation to deliver a discourse upon the thirty-fifth anniversary of your Institution, it will naturally be expected that I should do something in furtherance of the object of your organization, and this duty I propose to discharge by an account of the origin and history of Institutions for the promotion of the useful arts.

I have selected this subject because it embraces a kind of information which it is not very easy to obtain. It has to be drawn from a great variety of sources, and has never, as far as I know, been brought together in a collected form. It is exceedingly interesting, and will be found to be very instructive.

That public mode of bringing before a people the evidence of their progress in the useful arts, which in this country and in England is called a Fair, is in France distinguished by the more discriminating appellation of an Industrial Exhibition. A Fair in fact is something very different; and as that institution, once extensively spread over Europe, is now rapidly passing away, and has in some countries ceased altogether, it will be both interesting, and at the same time, a proper opening of my subject, to give some account of it.

A Fair, in fact, was nothing else but a market, as its name denotes, which is derived from the Roman word "Forum," signifying a market place. It was a coming together of merchants, farmers and traders, periodically at some fixed place, for an interchange or for the sale of commodities; and, though many things were inseparably connected with it as the necessary consequence of the assembling of a large number of people, its chief object, whether confined to the inhabitants of a particular district, or embracing, as many of the large fairs did, merchants and traders from every quarter of the globe, was uniformly the same—a general traffic in merchandize. It was an institution that arose from necessity in the earlier stages of society, or in countries where the population was sparse, and intercourse between separate communities was attended with great difficulty. It was therefore of very early, and probably of Asiatic, origin.

It has existed in India from a remote antiquity, and in other parts of the east. It was found to be the established form of commercial intercourse among the natives of Mexico and Peru, when first visited by the Spaniards, fairs being held in all the principal cities, the object and the manner of conducting them differing in no material respect from those of the fairs of Europe and of Asia. The largest was held in the great capital of Mexico. "The city then," says Prescott, "swarmed with a motley crowd of strangers, the causeways were thronged, and the lake was darkened by the canoes of traders flocking to the great *tangues*."

These institutions existed in Europe as early as the 7th century. By the 12th they were widely diffused; and the way in which they came into existence there will serve to explain the manner of their origin generally.

From the 4th to the 8th century Europe was devastated by those savage tribes which came pouring in from Asia, overthrowing not only the Roman Empire, but sweeping away nearly every vestige of the ancient civilization, and substituting in its stead their own rude customs. A state of perpetual war existed for four centuries, which broke up the established forms of society, destroyed commercial intercourse, and brought about that state of semi-barbarism familiarly known to us as the Dark Ages. In such a condition of society, there was little necessity for, and scarcely any means of commercial intercourse. Security was to be found only in towns or under the shelter of the castles of barons; and travelling was so rare, that people living in close proximity knew comparatively nothing of each other.

When at last the work of demolition was complete, a period of rest and torpor succeeded, during which the seeds of a new civilization were sown. Isolated communities were gradually cemented into new nationalities, having new wants, and creating the necessity for commercial intercourse. It was, however, beset with obstacles.

Travelling was not only difficult, but dangerous. The magnificent roads left by the Romans had either been broken up for military purposes, or had fallen into decay. The habits which many centuries of war had engendered begat the desire of living exclusively by plunder; and over every part of Europe bands of armed robbers infested the public ways, so that nothing of bulk or value could be carried without an armed force to protect it. When merchants, therefore, of any country desired to carry its products for interchange or sale to another, it was necessary for them to unite together for mutual protection, and move in large bodies, strongly armed, at those seasons of the year most favorable for travelling.

Though we can assume but little in respect to a period, the history of which is so obscure, it is probable that the great fairs, which were the chief marts for the sale of commodities carried overland down to the 16th century, had their origin in the circumstance, that many of those bodies of merchants encountered each other about the same period of the year, at central points in the great routes of travel, where they found it more convenient to stop and interchange their merchandize—an arrangement highly advantageous, as it enabled each merchant to bring back with him the products from various parts, while at the same time he extended the market for his own. Another circumstance had to do, not only with fixing the place for holding these great Fairs, but also in giving rise to the small local Fairs, and to many usages and customs connected with both.

In the Middle Ages the devotional spirit of the people prompted them to visit the shrines of particular saints, usually in those places where they had suffered martyrdom, or where their relics were kept, and where costly religious edifices had been erected to their memory, surrounded by abbeys or great monastic establishments. Those pilgrimages were generally made at those periods of the year most favorable for travelling, or with a view of being present on the occasion of the more imposing religious festivals; and as travelling, as I have said, was both difficult and dangerous, it was usual for the pilgrims to set out in large bodies, receiving addition to their number from all who were journeying in the same direction. They embraced individuals in every rank of life, the trafficker in merchandize being as faithful in the discharge of the duty as any other. But with that eye to business which is never wanting, when the mercantile instinct points out the possibility of advantage, he usually managed to carry with him a tempting assortment of the kind of goods which he knew would be most in request among the people assembled at the holy place, the safe transportation of which was secured by the presence of the formidable body of pilgrims in whose company he travelled. In this way he not only indemnified himself for the expense of his journey, but, if lucky in his speculation, enjoyed the additional satisfaction of knowing that he had both served God and turned an honest penny.

When the multitude had gathered together, the religious exercises that ensued were not more striking than the busy scene of traffic that followed. In fact, what occurred then was what occurs now, at the annual Mahometan pilgrimage to Mecca (a very interesting account of which will be found in Mr. Oscanyan's late admirable work upon Turkey) in connection with which, one of the greatest Fairs in Asia is held, and at Hurdwar, in Hindustan, a most sacred place of Indian pilgrimage, at which, on certain great festivals, a million and a-half of people come together for the united purposes of religion and trade. A gentleman, long resident in the East, has told me that he was present on one of these occasions, when the number assembled was estimated at two millions.

The same causes that led to the annual recurrence of great Fairs at the chief places of pilgrimage, led also to the establishment of local Fairs on Sundays and holidays, in nearly every place where a church was erected; and the bell, which announced from the steeple that the mass was over, was the signal for the market to begin. These Fairs, especially the larger ones, were a source of revenue to the abbeys or great religious houses, a toll being exacted from all who came to trade, and a sum for the use of a stall, from the proceeds of which these establishments were able to entertain the multitude of poor pilgrims during their stay, as well as to dispense, at all times, those larger charities to the sick, the helpless and the forsaken, of which, in the Middle Ages, they were nearly the only almoners. There were about seven or eight of these large Fairs held annually in different parts of Europe, to which, at that time, all the larger merchants resorted; while the smaller or local Fairs, in the absence of trading towns, were the places to which the people went periodically to supply most of their wants for the ensuing year. The manner of conducting these Fairs, whether large or small, was generally the same. The time of holding them, and the period of their duration, being either established by usage or fixed by law. They were usually held in an open plain, the larger ones commonly covering a space of six or seven miles; and, if it was in the vicinity of a town, all business and trade was suspended there, while the Fair lasted. The manner in which they were organized and carried on was entirely Republican, being, in a Feudal age, in strong contrast with the existing forms of government, and furnished a practical lesson which was not lost upon the people. Every one who had any interest in the Fair as a merchant or trader, had an equal voice in determining how it should be conducted. A President or head was chosen, with whom was associated a council of select men, in whom all power was vested, as the representatives of the whole. A Board or Court was appointed for the settlement of disputes, and for the punishment of all offences; and a police established for the maintenance of order. The Court was composed of men selected from the principal merchants. It took cognizance of everything done at the Fair; settled every dispute; and meted out to every offender the punishment due to his offence. The proceedings were very summary. Justice was administered upon the spot. Execution instantly followed the sentence; and no lawyers were allowed to appear before it.

On the day appointed for holding the Fair, it was opened by public proclamation, and closed on the day prescribed, in the same manner—all trading before and after being strictly prohibited, under penalties. Certain privileges or rights were established by universal usage, and rigorously maintained in all countries. No merchant could be arrested, either in his person or his goods, in going to or coming from the Fair; nor while there, unless for a debt contracted, or which was made payable there. In what were called Free Fairs, which were always the largest and most popular, all customs upon goods were generally remitted. There was another privilege, and a very important one. In the Middle Ages no one could follow any trading occupation, in any place, unless he was a member of the corporation or Guild, having the exclusive right to carry it on there. All trading and mechanical pursuits were fettered by these local monopolies. But at the Fairs every one was free to buy and sell. There was no restriction or exclusive privilege; and it was this feature, carried out upon an extensive scale, that laid the foundation of that great principle which is the life of modern commerce—freedom of trade.

The number of persons collected together was, at times, immense; and the amount of business transacted enormous. Even as late as the last century, the Fair of Beaucaire at Languedoc, in the south of France, was scarcely ever attended by less than 300,000 persons. The dealers in particular commodities were always arranged in separate streets, so that the purchaser could go at once to the quarter that contained whatever there was of the commodity he wished to buy. The wares were exhibited upon stalls, as is still the custom in the East; and a marked feature were the tables of the money changers, an important vocation, for the coins of all nations were brought there by traders from different parts of the world, the marketable value of which was determined by these brokers, who did a very active business, not only in the buying and selling or changing of money, but also in loaning it to facilitate commercial transactions. Indeed it is highly probable that many of the usages of modern commerce, the origin of which it is impossible to trace, were first established by these early traffickers in exchange.

When the arrangements were all completed and the Fair formally opened, the spectacle presented was picturesque and striking. Booths and tents were spread out in every direction to supply the wants of guests; and as a multitude of people cannot be collected even for the purposes of trade, without having some leisure time to amuse themselves, every attraction of that nature was held forth, to induce their coming and prolong their stay. Our old literature is full of allusions to the various amusements that delighted the eyes, excited the wonder, and charmed the senses of the admiring crowds. The rope dancer, the tumbler, the contortionist, the gymnast, the walker upon stilts, the singer of ballads, and the fortune teller, drew together their respective crowds. Harlequin, the Clown, and the Pantaloon, went through those feats and drolleries, which for so many ages have been the delight of the multitude. The exhibitor of that unfailing source of mirth, the Puppets, divided attention with the dancing bear and the mock doctor, whilst everywhere the gambler was to be seen busily engaged in the practice of those deceptive arts, which have their success in the mingled cupidity and credulity of the victim. In fact, these gaming arts are very old. There is a drawing in Wilkinson from one of the earliest of the Egyptian monuments, representing two figures, one of whom is the proprietor of four small cups, upon one of which the other, with confident eagerness, is laying his finger, showing nothing less than that game of deception which on the Long Island race-course is known as the Little Joker, and which the English call Thimble Rig. In that crystalised civilization of India, there is not, at the present day, a Fair, nor any considerable gathering of people, at which the adroit practitioner of this deception may not be seen, differing only from the Long Island swindler by the peculiarity of his shaved head. There were also athletic sports of different kinds, races, stage plays, and many other entertainments, which furnished together an endless round of amusement.

With the advance of civilization and the growth of commercial cities and towns, which are in fact but permanent Fairs, the necessity for these institutions ceased. They became, at last, little else than places to which people resorted merely for amusement; and so far from promoting industry, or serving the purposes of commerce, they but drew together the idle, the dissolute, and the profligate, leading to such scenes of debauchery, vice and intemperance, as to make their general suppression, in many countries, an act of public necessity.

They continued to be very numerous, however, in Europe, even to the close of the last century, and are still continued in the more eastern part of it upon a very extensive scale. The great Fair of Nisji Novogorod in Central Russia, which is held once in every three years, is attended by nearly half a million of people. Here the products of Europe are exchanged against those of Asia. The waters of the two rivers, the Oka and the Wolga, at the confluence of which it is held, are covered with a mass of shipping; and at no place in the world is there such a mingling of different nationalities; Russians, Circassians, Persians, Chinese, Tartars, East Indians, Swedes, Danes, Germans, French, English and Americans, with their various costumes, habits and languages, all intermixed in the unceasing strife of traffic during the two months which the Fair lasts.

It will be seen from this description of the Fair, that its object was very different from that exhibition of the industrial products of a nation—agricultural, manufacturing and mechanical—which we have designated by the same name. But the great Fairs did, in a degree, partake of the character of an international industrial exhibition, inasmuch as they brought together the products and people of different nations, and gave the spectator a general view of the varied industry of the world. Though they did much in this way to disseminate a knowledge of the industrial productions of different countries they did little to stimulate the useful arts. Neither tools, utensils, machines or new inventions were ever seen at these Fairs, nor was agriculture or horticulture encouraged by any exhibition there of products of superior excellence. This has been the peculiar province of the modern industrial exhibition which is of very recent origin extending no farther back than about the close of the last century. There were instances of great festivals instituted by the absolute monarch of antiquity which may be said, at least, in their effect, to have partaken of the character of modern exhibitions from the great display which they made of the industrial arts and the spirit of emulation they awakened.

Ptolemy Philometer, one of the most magnificent of the Egyptian monarchs, about 150 years before the Christian era instituted a festival of this description at the city of Alexandria upon a scale so stupendous that the details, as we read them in Athenaeus, strike us with astonishment. It was designed to exhibit to the world what the leading art and skill of Egypt could produce, and independently of what was exhibited in a gorgeous procession, we read in the decoration of the great pavillion of a display of furniture, that in its costliness, richness and variety would startle our modern cabinet makers. One hundred couches of gold, covered with purple cloth of the finest texture, gold and silver vessels, and other utensils for table use, set with precious stones. Tunics of gold cloth exquisitely worked, rich carpets with figures of animals admirably executed, Hangings and stuffs representing, in the style of the Gobelin tapestry, fabulous or historical scenes, precious vases, collections of pictures and statues and other triumphs of Egyptian art. Such a spectacle, the expense of which was paid from the King's treasury, was certainly a remarkable display of the industrial arts, though expended in the production of things of useless magnificence.

In Venice, at the installation of a Doge, it was the custom of the merchants to add to the magnificence of the spectacle, by making a display in front of their warehouses of their most costly goods, and though but an occasional exhibition and at remote intervals, it could not be without its effect in a city as celebrated for the excellence and variety of its manufactures, as for the great extent of its maritime commerce.

We come now to the first attempts to aid the industrial arts by the co-operative efforts of individuals organized in societies. In the year 1721 three letters were published in England, recommending the establishment of a chamber of arts, for the preservation and improvement of operative knowledge, the mechanical arts, inventions and manufactures; but nothing came of this suggestion. Who the anonymous writer of these letters was, is unknown. It is frequently so with those who make first suggestions. The Erie canal was originally suggested and its feasibility, probable cost, and prospective advantage pointed out by an anonymous writer in a country newspaper.

In 1743, twenty-one years after these three letters appeared, Benjamin Franklin put forth, under his own name, a printed pamphlet, proposing a plan for the establishment, in Philadelphia, of a society for promoting useful knowledge in the British plantations in America. Like everything proceeding from that remarkable man, it bore the impress of his original and practical mind, and had in it the germs of numerous institutions now existing in this country and in Europe. The details of his plan are too long to present them here. The leading object was to obtain suggestions upon a variety of subjects, hints, observations and experiments, that they might be examined, discussed, and the knowledge of them extended, with the view of leading to important discoveries. This was to be accomplished by the establishment of an extensive system of correspondence, and by the holding of monthly meetings in Philadelphia, at which all matters communicated might be made known, examined, discussed and published. How much was comprehended in his plan, and how directly it was designed to bear upon the development of the useful arts, may be judged from the subjects embraced in the closing paragraph, which was in these words, "All new agricultural experiments, new methods of improving the breed of animals, new facts in chemistry, in the assaying of ores, and in distillation. All mechanical inventions which tend to the saving of labor, any new art, trade or manufacture that may be thought of or suggested, and especially all experiments that let light into the world, that increase the power of man over matter, and multiply the conveniences of life."

His suggestion led to the establishment of a society in Philadelphia in the course of the following year, which in 1769, in combination with another body called the Junta, was formed into the American Philosophical Society, an institution which is still in existence. But Franklin's suggestion produced other fruit. A copy of his pamphlet found its way to England, and fell into the hands of one William Shipley, a drawing master of London, who was so impressed with it that he resolved, by his own efforts, to establish a similar society in England. Though following the humble occupation of a teacher of drawing, he had aristocratic connections and influence sufficient to induce twelve gentlemen, several of them men of rank, to unite with him, in the formation of a society of which he became the secretary. This was the beginning of the London Society of Arts, now a powerful institution which, under the presidency of Prince Albert, brought about, after six years of unwearied effort, the great international exhibition in London, at the Crystal Palace, in 1851. The first meeting in 1754, was held at a London coffee house, when an address to the public was adopted in which the idea was *first* unfolded of stimulating the industrial arts by the offering of rewards and premiums. In this address, which was probably the production of Shipley himself, the public were informed that the society had been constituted for the encouragement of arts, manufactures and commerce, and would bestow rewards, from time to time, for such productions, inventions and improvements as might tend to the employment of the poor, to the increase of trade, and to the riches and power of the nation, and that to make a beginning they had concluded to offer three prizes, £30 for any one who would grow *madder* in England, a most precious root for dyers and calico printers, £30 for the discovery and working, in Great Britain, of cobalt, a metal very difficult to reduce from its ores, the oxide of which imparts a rich blue to the glaze of porcelain and stone ware, and £15 in smaller prizes for the best drawings by boys and girls, under the age of fourteen years.

To describe what this society has done, to use the language of its presiding officer, at its centennial anniversary in 1853, would be to relate the history of arts, manufactures and inventions, from 1754 to the present time. There is scarcely a branch of the industrial arts that has not felt its vivifying influence. Before 1790 its rewards had effected great improvements in agriculture, especially in the cultivation of hemp. They led to the introduction of bone manure to the analysis of soils, to improved agricultural implements, to better modes of irrigation and to many valuable improvements in manufactures and in the mechanic arts; and its labors have since been continued, embracing a very wide field of operations, such as the improvement of British fisheries, the breaking up of monopolies, and in effecting the repeal of many laws injurious to trade, and commerce, and the enactment of others of a beneficial character. In 1760 it offered a premium for the invention of a machine that would spin six threads of wool, flax, silk or cotton—cotton being then spun only by hand. In four years after, Hargrave, a poor workman in a cotton-factory in Lancashire, produced a machine that would spin *eleven*, which, improved by Arkwright, resulted in the spinning Jenny, an invention which, together with Watt's improvement in the steam-engine about the same time, revolutionized the whole manufacturing system of England, and made it the enormous source of wealth and power it has become. When the society was organized in 1754, England imported but three million lbs of cotton annually. In half a century after, she imported annually 130,000,000. One of the earliest prizes offered by the society was for the best specimens of carpets, the manufacture of which was, at that time so trifling as scarcely to be deserving of notice; England is now the seat of the great factories of Kidderminster, Axminster and Wilton. At the same time it offered another prize for porcelain. Tho best fabrics then were brown or black pans, known as Staffordshire ware. In eighty years England's exports of the finest porcelain, embracing every variety and form, exceeded in value half a million of pounds sterling annually.

In 1760 it gave an exhibition of the works of British artists, the first attempt at an exhibition of the kind, and which led to the annual exhibitions afterwards instituted by the Royal Society. In the following year it opened, and has since continued, a yearly exhibition of new inventions, with a person in attendance to explain them. The Society of Arts has now an annual income of $10,000. It has a library, a museum of models, a building of its own, and has expended over half a million of dollars in rewards and premiums. It has put forth 50 volumes of its transactions, and for the last ten years has published a weekly journal, and the extent of its operations may be judged by the fact that 307 institutions in Great Britain alone, are in connection with this great parent society.

Jacquard, who was a plaiter of straw hats in Lyons, had his attention first drawn, in 1799, to the subject of the extraordinary loom which has immortalized his name, by seeing in an English newspaper, the prize offered by this society for a machine that would make nets or fabricate lace; and other instances might be given of the direct influence it has had in leading to inventions, the effect of which, upon the world, it would be impossible to estimate. In 1783, eighty years ago, it offered a prize for a machine that would mow or reap, which led to many attempts in England, and after nearly half a century had transpired, the desired invention was produced in the American reaper of McCormick.

But though the society instituted the system of rewards and premiums, and had small yearly exhibitions of new inventions, it did not reach the further step of a national industrial exhibition, the honor of conceiving and of successfully establishing which, belongs to France; and it may gratify those who believe in the effect which republican institutions have upon individual enterprise, energy and invention, to learn that the idea was first conceived and successfully carried out in the days of the first French republic. The circumstances which led to the movement are interesting, and I will relate them.

In 1797 the Marquis d'Avèze, the manager of the Academy of Music, then known as the Theatre of Arts, was appointed by the government commissioner of the three manufacturing establishments carried on by the old government, known as the Gobelin tapestry, the Sèvres China and the Savonierre carpets. Upon going to look after his additional charge he found the workshops vacant, and that the workmen had been for two years almost in a state of starvation, whilst the warerooms were full of rich carpets, exquisitely painted china, and the finest specimens of Gobelin tapestry. Greatly moved at the scene of misery he beheld contrasted as it was with the beautiful productions, the result of the ingenious and patient labor of the now starving operatives, "a luminous idea," as he afterward said, "burst upon his mind," that he would get the consent of the Minister of the Interior to make a display of that rich and brilliant collection in one of the largest palaces, which all the inhabitants of Paris should be invited to come and inspect as specimens of the native industry of France, in the expectation that sufficient of these costly articles could be sold to relieve the pressing wants of those whose skillful hands had wrought them. The consent of the minister was obtained, and the humane and enthusiastic marquis set to work and got up a most attractive exhibition at St. Cloud, but on the very day it was opened the Decree of the Directory went forth banishing all the nobility from France, in which he was included. The fame of the forthcoming exhibition, however, had spread over Paris. The national pride had been awakened by the announcement of the display of those exquisite specimens of French industry. The court yard of St. Cloud was filled with elegant equipages, its rooms thronged with admiring and wealthy visitors, when in the midst of his triumph the marquis received notice that he must instantly leave the country; that he must in 24 hours be at least 30 leagues beyond Paris under pain of death, and with his departure the exhibition and the humane object that gave rise to it terminated. "I had in imagination," he afterward said, "conceived the idea of an exhibition of *every* product of national industry and manufacture." And when a man has once got in his mind an idea of something that the world has never thought of before, it is not very likely to leave it. This was the case with the marquis. During three years of poverty and exile that bright thought never quitted him, and when in 1798, he with Talleyrand and others of the exiled nobility were allowed to return, the first thing that he did was to devote himself to the carrying out of the project he had so long cherished. He succeeded in obtaining the use of the Maison d'Orsay, a large and beautiful building in Paris; and having done that he then went among the leading artisans, manufacturers, and all engaged in the industrial arts, and obtaining their co-operation, collected together a most attractive and aristocratic display of articles of French manufacture, which he opened as a free exhibition to the public. It embraced the richest furniture, different kinds of inlaid work, the finest watches of the world renowed L'Epine, the silks of Lyons, the superb porcelain of Sévres and Angoulème, fine specimens of printing, rich book binding, with many other things chiefly of a luxurious character, with which were united the historical pictures of David, the landscapes of Valenciennes and the flower pieces of Pankouk. The experiment proved such a complete success that the government resolved to follow it up immediately by a more extensive exhibition under its own auspices. The period was propitious. That portion of the years 1797 and 1798, which in the French republican calendar is known as the year VI, was a most eventful one for France—Bonaparte by the successive victories of Arcole, Rivoli and La Favorita, had made himself master of Italy, Moreau had crossed the Rhine, and extended the boundaries of the republic to that river, advantageous alliances had been formed with Spain, Sardinia and the two Sicilies, preliminaries of peace had been signed with Austria, and a conference opened for a settlement of peace with England. The Minister of the Interior, Neufchateau, in connection with the Directory, determined to seize upon this happy moment of returning peace to direct the attention of the people to the important subject of their national industry by getting up an exhibition under the direction and at the expense of the government, of the products of French manufacture, and that a proper spirit of emulation might be awakened, it was concluded to offer prizes for the best productions, in imitation of a practice adopted at the agricultural fairs in the last days of the monarchy. To enlist the patriotic feeling of the people it was determined that this display should take place in the Champ de Mars, where but a short time before a national fete had been given to celebrate the victories in Italy, and also that the exhibition should be inaugurated in the following September, upon the anniversary of the day of the foundation of the republic. In a space of time so short, that it seemed like the work of enchantment, a building was erected, having 60 porticos, to which the title was given of the Temple of Industry. In the brief space of six weeks it was opened gratuitously to the public with great pomp, but the time was so short that the exhibition embraced only the manufactures of the department of the Seine and the adjoining prefectures; the other parts of France contributing nothing. But limited and local as it was, it excited the greatest enthusiasm. "It was," says the celebrated Chaptal, (one of the judges,) "the first knowledge that France had of her manufactures, and the effect of it was a great movement in every department of the useful arts." And another contemporary writer triumphantly referred to it as a proof that the revolution had created a new France. The next exhibition took place after an interval of three years, the third in 1800, when 63 departments of the nation were represented by 540 exhibitors, presenting such a spectacle as to draw from Napoleon the remark that France by that display had achieved the finest of her victories, (*la plus belle de ses victoires.*) This exhibition led to the establishment in Paris of the society for the encouragement of National Industry, which has this year issued the 62d vol. of its transactions. Its object was to collect and disseminate knowledge of all useful machines, and discoveries connected with the progress of the useful arts. To offer prizes of money or medals for valuable discoveries or inventions, to succor distinguished artisans who were unfortunate, and lastly to be the centre of similar institutions throughout France. It began simply by offering four prizes amounting to the limited sum of $750, Its annual prizes now amount to $20,000.

Since 1798 France has had thirteen of these great industrial displays, including the international exhibition of 1855, and is now preparing for another, to be held next year. They have usually been given at intervals of four or five years, in every instance under the direction and at the expense of the government, each of the ordinary ones excelling that which preceded it in extent, variety and interest. When the government took the matter in hand, in 1798, the original projector, the Marquis d'Avèze, disappeared from view, not to reappear until 1844, nearly half a century afterwards, and after nine exhibitions had taken place, when he modestly came forth a very old man, to claim, by a reference to official documents, from a nation that had forgotten him, that it was to him and not to Neufchateau, the minister of the Interior, that they were indebted for an idea which had been productive of such enormous benefit to France.

Of course, I could not go through the details of these various exhibitions. To do so would require a volume. I can give only the result which half a century produced. In 1798 the number of exhibitors was 110, and there were 23 prizes. In 1849 the number of exhibitors was 4,494, the awards, 333 medals of gold, 722 of silver, 974 of bronze, and 32 decorations of the Legion of Honor.

Equally impossible would it be to give the effects which these great industrial spectacles have had upon the industry of France, one striking fact must serve to illustrate it. In 1812 the manufacture of merinoes was scarcely known. The exhibitions of 1819 and 1823 brought them into general notice, and in 1827 the amount of merinoes disposed of yearly exceeded fifteen million of francs.

In 1798 a gold medal was offered (I use the words of the circular) for that which would prove the deadliest blow to the industry of Great Britain, England, then being far in advance of France, in manufactures and in the mechanic arts. In 1844, even British writers acknowledged that the industrial display at the exhibition of that year, in Paris, was such as no other nation but France could have made.

The French writers attribute the wonderful progress of French industry to four causes, the diffusion of knowledge, scientific and practical, among the working classes, through the establishment of free local libraries, museums, drawing schools, and other means of practical instruction. Secondly, inventions and discoveries. Thirdly, the repeal of restrictive laws—and lastly, the effect of the great industrial exhibitions. The effect of these exhibitions may be briefly stated. They have focalized the industry of the country, by bringing it under view as one spectacle, thus enabling all to know, from time to time, the exact state of it. They afforded means of comparison which did not previously exist, not only to those engaged in a particular pursuit, but also to those employed in those pursuits which act reciprocally upon each other. They have created a mutual interest between the man of science, the manufacturer, the capitalist, and the working classes. The intelligent criticism to which they have given rise in the various industrial journals, not only from scientific men, but from manufacturers and workmen, have been of the greatest benefit. Their regular recurrence has kept up a spirit of emulation, in the desire to produce something better and cheaper than before. They have served as a means of advertising new or superior productions, upon a scale the most extensive, and have led to the gradual development of the business theory of large sales with small profits. They have stimulated inventions by keeping up the constant desire for new discoveries, improved methods, and better machinery; and lastly, they have dignified labor by giving it something more to struggle for than mere pecuniary compensation.

The exhibition of 1844 had a marked effect throughout Europe. It led immediately to similar exhibitions for the encouragement of national industry in Sweden, Belgium, Prussia, Spain and Ireland, and when it was followed up by a still greater display in 1849, the British lion stirred himself and got up in 1851—the exhibition in London of the industry of all nations, a spectacle visited by over six million of people. I had the satisfaction of visiting that magnificent display, and thought that nothing could ever equal it, yet the French surpassed it at the great international exhibition, at Paris, in 1855. There were 20,700 exhibitors at Paris, being nearly 6000 more than at London, and 96,000 persons visited the Paris exhibition in one day, 3000 more than the highest number attending the Crystal Palace in a single day.

In 1853 an international exhibition was given at the Crystal Palace, in this city. It was followed by a great exhibition at Munich, in Bavaria, in 1854; others have since succeeded, and in the present year, 1863, a National Industrial Exhibition has been held at Constantinople. The project was undertaken by a private company, under the auspices of the government, and a price was charged for admission, the proceeds from which, however, did not cover one-tenth part of the expenses. The Turks, however, did not understand it. When asked to go and see, the follower of the prophet shrugged his shoulders and uttered, what to him, was an unanswerable argument, "Why should I pay to see what I see every day for nothing in the Bazaars." The exhibitors, moreover, looked upon it as a fair, to which they sent their goods, expecting to sell them; and as the government unwisely undertook to derive a revenue from their sale, and fixed an arbitrary price upon each article, the result was a pecuniary loss to both the exhibitors and the company. Still, a beginning was made, which is a great thing in Turkey, and one of the results of it has been a resolution on the part of the Pacha of Egypt to have an exhibition of the kind at Alexandria next year, of the industrial products of Egypt.

In 1763 the London Society of Arts extended its offers of premiums to the British colonies in North America, and this led, in 1764, to the formation of a society in the city of New York, called *The Society for promoting Arts, Agriculture and Economy in the Province of New York, in North America.* It engaged to act for those desirous of competing for the premiums offered by the London Society, but in addition offered premiums on its own part, with a liberality exceeding anything that has ever been done in this country. In the second year of its existence it bestowed £600, in premiums —a very large amount compared with the present value of money. These premiums were for the dressing and spinning of flax, the manufacture of linen and woolen cloth, felt hats, silk thread, the tanning of leather, slate and tiles for roofs, whale oil and agricultural products. The society was composed of the most influential men of that day, and in addition to offering large premiums annually, —one of which was as high as £100—it maintained a linen factory in the city by a subscription among its members, and in some cases awarded medals as an especial mark of distinction. A writer in the New York Mercury of 1767, thus speaks of it "It has proved much, and was encouraged by all the most eminent and best friends of the country, and you can scarcely believe how it cheered us in our distress. We must acknowledge that it has done signal service among us by introducing not only the spinning and raising of flax, but in encouraging many other useful manufactures and growths among us." Economy, as well as the encouragement of agriculture and the arts, was among its objects, and it may be interesting to quote one of its resolves upon this subject: "No member of the society will put himself in mourning, and to retrench the ill-timed and expensive charges of our funerals; no member shall give any scarfs, except to the clergy, nor any *hot wine* to any person." This society ceased in 1774, in consequence of the disturbed state of things immediately preceding the revolution.

The American Philosophical Society, of which Franklin was the President until his death, was, as I have already mentioned, established in 1769. In the beginning it gave some attention to the useful arts, as respects inventions, the art of dyeing, and a few other subjects, but it gradually became what it has ever since been, a scientific society of the same character as the Boston Academy of Arts and Sciences, or the Smithsonian Institute.

In 1785 the Philadelphia society for the promotion of Agriculture, was established. It continued to meet regularly for several years, and to publish in the newspapers of the day communications from practical men upon topics connected with agriculture. In 1790 Hamilton's celebrated report upon manufactures appeared, in the course of which he drew attention to the societies in Europe, by whom premiums were offered for the encouragement of agriculture, manufactures and the arts, remarking that though voluntary bodies, with but slender funds, their utility had been immense; and he justly recommended the adoption of the practice in this country, declaring with foreshadowing wisdom, that if the government of the Union would undertake and support it, vast benefits might be expected. The suggestion, it would seem, had some effect upon the Philadelphia Society, for, in the following year, 1791, it offered thirteen prizes, consisting of gold and silver medals, chiefly for the elucidation of questions connected with the practice of agriculture, shortly after which this society ceased its labors for several years.

In 1791 Chancellor Livingston, Dr. Mitchell and several other gentlemen, held a meeting in the city of New York, and formed a society for the advancement of agriculture and the arts, which was incorporated in 1793. One of its earliest steps was to issue a circular, containing queries, designed to collect information upon a variety of subjects connected with the objects of its organization, among which, as belonging to our branch of enquiry, were questions connected with the manufacture of woolen and cotton goods, sole leather, glass, china and earthen ware; the communications resulting from which were published by the society in a volume. Its labors, however, were chiefly devoted to agriculture, though the steam engine, the manufacture of paper, distillation and dyeing, are among the subjects upon which papers were published.

In 1792 the Massachusetts society for the promotion of agriculture was established. In 1800 it followed the practice of the New York society, and distributed throughout Massachusetts a printed circular, requesting answers to some fifty questions relating to agriculture. The practice was continued for some years, and the information obtained by this means was printed by the society with other matters, in a series of papers extending from 1801 to 1815.

In 1804 the Philadelphia society was revived, and in the following year it resumed its practice of offering premiums of gold and silver medals. It offered that year the large number of fifty for the best essays upon designated subjects; for the finest specimens of certain products, and for the best linen, woolen and cotton fabrics. In 1824 it awarded premiums of money and plate. This society existed until 1850, and between 1811 and 1826 it published five valuable volumes, embracing matters relating to agriculture, manufactures and the mechanic arts.

The charter of the New York Society for the promotion of agriculture and the arts having expired by its own limitation in 1807, the Society was renewed by an act of the Legislature of that year under another name, "The Society for the Promotion of Useful Arts," and as such it published four volumes of its transactions, embracing a variety of subjects.

In 1807 it presented a piece of silver plate to a Mr. William Briggs, of Schoharie, for five specimens of woolen cloth of a superior quality, manufactured in his family; it appearing that his daughters manufactured 1200 yards of woolen cloth annually; a model example certainly of domestic industry. It will also be interesting to mention that I find in looking over its transactions that in 1808 a Mr. Abraham Bloodgood exhibited to the Society a model of a floating battery, involving substantially the principle of the turret in Erickson's monitor, a drawing and detailed description of which is given. The vessel was designed to be anchored, and in the center of it was a revolving circular battery pierced for eight guns, above which was a turret pierced for musketry, the whole moving upon a pivot attached to the keel of the vessel, a rotary motion to which could be given by hand, by horse power, or by sails attached like those of a wind mill. The description sets out its advantages in these words: "By its rotary motion the cannon can be brought to bear successively as fast as they can be loaded upon objects in any direction. Being circular, the shot that strike it will glance off. The men within are entirely protected from the enemy's fire. Boarding would be impossible, and it can be made so strong as to be impenetrable to a cannon shot."

Between the years 1790 and 1816 the Legislature of the State of New York passed many acts, at different periods, loaning the money of the State to individuals upon security, to enable them to establish or carry on various kinds of manufactures, such as woolen, linen and cotton goods, earthenware, leather, cut nails, glass and the fabrication of iron. In 1808 it passed an act giving premiums annually for the best specimens of woolen cloth manufactured in the State. The Society, for the promotion of the useful arts, was authorized to award the three highest, and the Judges of the County Courts were empowered to award in their respective counties premiums varying from eighty to thirty dollars, and this law was continued in force by successive enactments until 1814, involving an entire expenditure on the part of the State, for this purpose, of over twenty thousand dollars. The Society for the promotion of the useful arts declared that the giving of these premiums had had a most beneficial effect, surpassing even their most sanguine expectations, and they memorialised the Legislature to continue the practice and extend it to other objects, but the public treasury was then in a state demanding the most rigid economy, and a few years elapsed before any further provision for such a purpose was made.

The first attempt to establish an industrial exhibition in the United States occurred in 1811, the merit of originating which belongs to Elkanah Watson. Watson had been engaged until his fiftieth year in mercantile pursuits, leading a very active life marked by those alternations of fortune, of success and misadventure, which, in this country especially, is so frequently the lot of the enterprising merchant. Weary of the cares of business and coveting that repose which is sought in rural occupations, he retired to Massachusetts, his native State, and purchased a farm in the county of Berkshire, near Pittsfield, intending to pass the remainder of his life in agricultural pursuits. Here he gave himself up earnestly to his new occupation, engaging in experiments to improve the breed of animals, and introducing edible fish into the lakes and streams about him. A man may change his mode of life and take up some new avocation, but he cannot as readily change long settled habits. After passing two or three years in this rural retreat the former merchant began to feel the desire for a wider sphere of activity; and a slight circumstance pointed it out to him. He had purchased a pair of merino sheep, and with the view of drawing the attention of the people of Berkshire to this important breed, he exhibited them for a day on the public square at Pittsfield, where they attracted a great deal of attention. This incident suggested to his fertile mind an idea, "If two animals," he reasoned, "excites so much interest, how much greater would be the effect of an exhibition of different kinds of animals." It occurred to him that an annual display at Pittsfield of the best animals in the county would create a spirit of emulation among the farmers, which might lead them to take greater interest in the improvement of their stock. And as the idea enlarged upon his mind the additional suggestion arose of making it still more useful by uniting with it an exhibition of the best agricultural products, and the finest specimens of those articles of domestic industry manufactured in the county. This was in 1810, and at that time linen, woolen and cotton fabrics were made in nearly every farmer's family, the women devoting themselves to this branch of industry, while the men attended to the duties of the farm, and it was a kind of industry, the increase of which had then become a matter of national necessity, as the prospects of a war with Great Britain was inevitable, when the country would be cut off from all foreign supplies, and be left to depend upon its own productions. Watson's design was to get up an annual exhibition, under the auspices of a county agricultural society, to be composed of the principal farmers, and as an initiatory step, he succeeded in inducing some twenty-six farmers to unite in a cattle show, at Pittsfield, in the autumn of 1810. From them, a committee of fourteen undertook the organization of an agricultural society; and this having been effected, after a great deal of difficulty, an act of incorporation was attained. Watson was placed at the head of it, and set himself zealously at work to carry out his plan, evincing a good deal of sagacity in the adaption of it to the habits and peculiarities of the people, among whom he resided. He was familiar with what had been done by the few agricultural societies established in Pennsylvania, New York and New England; but in his judgment they had failed to produce much effect, from the want of a proper mode of interesting the people and exciting among them a spirit of emulation. Their labors had been directed to the publication of a few volumes upon agricultural subjects, and to the offering of premiums; but so little interest was awakened that they could not, in many instances, find any competitors for the prizes they offered. "I felt," says Watson, "that to excite a lively spirit of competition some eclat was necessary," and this he proposed to do by getting up an agricultural and industrial festival every autumn in Berkshire, combining an exhibition of animals, with agricultural and manufacturing products; and that all classes might be attracted by it, to connect with it a rural procession, music, singing, dancing, a public address and religious exercises. His project, at first, found little favor. The wealthier and influential inhabitants looked upon it as ridiculous and visionary. Among that class which, in every community, regard themselves as the more intelligent, he was made a constant but for ridicule, and the country people, especially the women, were shy and hesitated to participate, from the fear of being laughed at. But Watson, by his tact and perseverance, overcame every difficulty, and succeeded in getting up a festival in October, 1810, at Pittsfield, which was attended by more than 3000 persons. The display of animals was large, and the following day a procession was formed, which, for the time and place, was an imposing one. A plough, drawn by sixty oxen, was held by the oldest man in the county, followed by a long procession of farmers wearing wheat cockades in their hats. On a moveable stage was a hand-cloth loom and a spinning jenny, worked by English operatives, and on another were displayed the various industrial products of the county, followed by a body of mechanics, the effect of the procession being heightened by a band of music and a display of banners, inscribed with the emblems of agriculture and manufactures. After marching around the town the procession proceeded to the principal church, where, after prayer, the singing of a festal ode in praise of agriculture, and an address by Watson, the premiums, which were placed upon a table beneath the pulpit, were publicly presented by the judges to the successful competitors. In addition to these ceremonies the skill of the younger farmers was tested by a series of ploughing matches, and the festivities were closed in the evening by an agricultural ball. Ela'ed by the success of this first experiment, Watson sought to produce a greater effect the following year by a more extensive offer of premiums. But $70 had been raised for that purpose on the first occasion, which had been bestowed exclusively for animals, and he was desirous of offering premiums for the best specimens of domestic manufacture. But the county was poor, and he wrote to his friend John Adams, to use his influence to raise some money in Boston, in aid of an object in which the country at large had so deep an interest. The reply of the Ex-President, was pithy and to the point: "You will get no aid from Boston, commerce, literature, theology, medicine, the university and universal politics are against you," showing how little the spirit of the times was then in favor of encouraging those manufactures which have since become such a source of wealth to New England. Notwithstanding the letter, Watson went himself to Boston and spent a month there, as he said, soliciting charity for a great public object, but without obtaining anything. He returned and resumed his efforts in Berkshire with more success. Exhibitions followed in 1812 and 1813, at the last of which 63 premiums, amounting to $400, were awarded, 17 for agricultural products, 20 for animals, and 26 for domestic manufactures.

After nine years of trial Watson learned that a man who has had no previous experience can scarcely hope after fifty to become a farmer, and the pursuit was attended with so many difficulties that it became irksome to him. He had formerly been at the head of a large commercial house at Nantes; had travelled a great deal both in Europe and in this country, and had mixed during his time in the very best society of London and Paris. To such a man an isolated life upon a New England farm was a deprivation of many things of a social and intellectual nature which are to be found only in cities, and accordingly in 1815 he sold his property in Berkshire and returned to Albany, where he had formerly resided, ending his days in this State at the advanced age of 85, after having rendered many valuable disinterested public services in aid of our canals, manufactures, banks, roads and our system of public education. The regret which his departure created in Berkshire was expressed by a public testimonial acknowledging the value of the services he had rendered to the cause of agriculture and manufactures, and by a tender leave taking on the part of a people who felt how much they had been indebted to him. Upon returning to this State he introduced what he called his Berkshire plan, and published a pamphlet detailing its history and the beneficial effects it had produced. Between 1817 and 1819 similar exhibitions were given in this State, chiefly through his instrumentality in the counties of Otsego, Schoharie, Cayuga, Jefferson, Montgomery and Rensselaer, which among the people were called fairs. Fairs had existed in the State previously. The Dutch established them as early as 1641. After the colony was ceded to the English an act was passed by the Colonial Legislature in 1691, providing for the holding of one annually in each of the counties, with all the "liberties, free customs and usages appertaining to fairs in England," including a Court of *Pie powder*, with authority to sit from hour to hour, upon all occasions during the fair, and issue writs, make arrests, impose fines, and exercise all the power belonging to such a tribunal. This is the peculiar Court before described, the name of which "*Pie powder*," we are told by Phillips, an old English lexicographer, is from two French words, "*pied*" foot, and "*poudre*" dust, indicating the dusty appearance of the suitors, and that their causes were summarily disposed of before they could shake the dust from off their feet. And about 1740 the Irish colony that settled Londonderry in New Hampshire established fairs there, after the manner of the parent country, which were held annually for many years.

In 1815 the Society for the Promotion of the Useful Arts recommended the holding of fairs annually in every county of the State, for the sale of agricultural products and domestic manufactures, each county rotating in turn—the time, place and manner of holding them to be fixed by a general law. They urged that by this means the people would become acquainted with their own manufactures, that it would open a wide field for competition, and ultimately lead to the production of articles of a superior kind. That in connection with the incentive of rewards and premium, they would gradually advance both agriculture and manufacture, while a protective law to restrain foreign importation and force the progress of native manufactures, would in the general effect tend to the injury of the community. This suggestion was made in consequence of the results of the industrial exhibition in Massachusetts, which the Society declared had vastly promoted agriculture, manufactures and internal commerce, but it was evident that they did not understand that these were simply exhibitions and not markets, and that their project of restoring the old system of market fairs in every county was absurd in a State throughout which towns and villages existed at convenient distances, and where the farmer could supply himself at all times with what he wanted, without the necessity of a fair, by simply going to the country store. Watson's plan embraced all that was practically useful, and when he afterwands introduced it in 1817 it was so successful and popular as to lead, in ten years, years to a very important enactment on the part of the State. In 1819 the Legislature passed an act which was continued in force for six years, appropriating $10,000 annually for the promotion of agriculture and domestic family manufactures. A proportionate sum was fixed for each county, upon the express condition that an agricultural society was formed there, which society was to receive within the amount limited a sum equal to such sum as the society should annually raise by voluntary subscription.

It was made the specific duty of the officers of these societies to award premiums, annually, for such productions as in their judgment were best calculated to promote the agricultural and manufacturing interest of the State. The President, or a delegate from each society, composed a Board of Agriculture, and to this body the society was required to transmit annually a report of its proceedings. The board was authorized to publish, at the expense of the State, such of their reports, or such other essays, as they might deem advisable, of which they published three volumes, under the title of the Memoirs of the New York Board of Agriculture, the last of which appeared in 1825. At the first meeting of this board twenty-three counties were represented, in all of which societies had been formed. The result of this measure is quaintly told by a cotemporary writer, who says that the money bestowed in premiums was like the seed sown by the husbandman. Some of it was devoured by birds of prey, some of it fell in stony places, some was choked in its growth by the brambles of ignorance or prejudice, but enough fell upon good ground to produce a hundred fold. He further says, that the inducement of distinction and reward called into active employment the genius, skill and industry of thousands; that the aggregate of production in his county increased from 15 to 25 per cent. and that in some instances the profits of farms were doubled, and that these were produced almost wholly by improvements consequent upon the law of 1819, and the labor of the county agricultural societies. In the distribution of the $10,000 annually the largest sum was given to the agricultural society of the city and county of New York, and this society, the year after its formation, instituted a fair for the exhibition of American products. It was held within the present limits of the city, at a place then known as Mount Vernon (situated on the East River, about on a line with Sixty-first street), on the 23d and 24th of October, 1821. It embraced a display of cattle, horses, sheep, agricultural implements, broad-cloths, cassimeres, carpets, blankets, linen thread, ladies' straw hats, porcelain, glue, musical instruments, and other articles. Prizes to the amount of $688 were bestowed, chiefly in silver plate, and diplomas were granted to contributors. The fair produced a great sensation at the time, and was visited by nearly 6000 persons.

On the 19th of October, 1824, a mechanics' fair was held at the old arsenal, in White street, in this city, under the auspices of a society which had been incorporated by the Legislature of the State in 1822, under the name of the Mechanic and Scientific Institution. It consisted of articles of American manufacture, such as woolen and cotton cloths, silk goods, American iron, paper, brass work, glass and glassware. $540 was expended in premiums, and the design was to continue it annually, but the members of the society quarreled among themselves, which led to the breaking up of the institution. The act creating the board of agriculture and the county agricultural societies, expired by its own limitation, in 1825, and the board, in putting forth its last volume, expressed the "ardent hope" that the Legislature would appreciate the great benefits which the law had conferred, and would perpetuate and multiply them by continuing the same enlightened policy. The Legislature, however, paid no attention to this request, and sixteen years elapsed before they again returned to the system of rewards and premiums, an indifference proceeding from causes which I will briefly explain.

The exigencies of the war of 1812 had compelled us to depend upon our own manufactures, the consequence of which was, that every branch of them was stimulated, and when the war closed they were advanced and prosperous, while *agriculture* and *commerce* were greatly depressed. All engaged in agriculture or commerce were anxious for the restoration of these two great sources of national wealth; but, as the natural effects of the war, a period of great depression set in, which ultimately extended to every branch of industry, and lasted for nearly ten years.

As happens in times of national prostration, a wide difference of opinion existed both as to the cause of it, and as to the remedy. In the Middle States it was generally thought that our whole policy should be devoted to the promotion of agriculture and the encouragement of our domestic manufactures, and the fairs or industrial exhibitions, with the incentives of rewards and premiums adopted in the State of New York, were the result of this conviction. In those parts of the country, however, which then depended chiefly upon commerce, New England and the sea-board cities, and in those States of the South for whose agricultural productions there was a market abroad, a very different opinion prevailed.

The people of those parts of the Union were not only indifferent to the subject of domestic manufactures, but inclined to the opinion that their further encouragement would be detrimental to the interests of agriculture and commerce. With an immense extent of sea-coast, offering extraordinary facilities for commerce, and a vast domain of land, embracing the whole of the South and the valley of the Mississippi, adapted to the growth of the great staples, it was urged that we were designed by nature to be a great agricultural and commercial people, and that it would be throwing away these natural advantages if the industry and capital of the country was employed to any considerable extent in manufactures, views which became widely spread and deeply rooted.

There was a large and influential class, however, in every part of the country, who steadfastly maintained that national wealth was derived from agriculture, commerce and manufactures combined, that each branch acted reciprocally, the interest of one being interwoven with that of the other, and that the true policy of the nation was to encourage our manufactures until they were sufficiently developed to bring about a system of mutual exchange.

There could be little doubt of the correctness of this general view, but the point of difference was, and has ever since been, as to the mode in which this encouragement should be given. Hamilton, in his report upon manufactures, in 1790, recommended a restrictive policy, at least to the extent practiced by other nations, in which Jefferson coincided, and after the war of 1812 these views were revived and warmly advocated by the democratic party in this State.

In 1816 the American Society, for the encouragement of domestic manufactures, was organized in this city, at the head of which was Daniel D. Tompkins, then governor of the State.

It put forth, in an elaborate address to the public, an exposition of its views, which will be sufficiently conveyed by a single extract: "We ask protection until our tender grizzle shall be hardened, and our joints knit." In 1817 the Connecticut Society, for the encouragement of domestic manufactures, was formed, the professed object of which was to urge our people to compare our own fabrics with those of other nations, and if of equal value and cost, to give them the preference—the society declaring that manufactures were the last hope of Connecticut. In the spring of 1819 the Philadelphia society for the promotion of national industry by protective laws, was established, and published, in the course of that year, twelve elaborate pamphlets, and in the following autumn the Tammany society of this city called a solemn council, and after a grand pow wow among the assembled warriors and braves, an "Address to the American People" was adopted and extensively circulated, urging the practice of national economy, and earnestly recommending the non-consumption of foreign goods, and the encouragement of our own manufactures.

On the 5th of February, 1824, the Franklin Institute, of Philadelphia, was established for the benefit of mechanics and manufactures, upon the model of a class of institutions which had shortly before that sprung up extensively in England. The founders of the institution were careful to specify that it should not be the exponent or advocate of any political views. They declared that they would take no ground upon the question of a protective policy, as it was one upon which there was great difference of opinion, but at the same time, as they were warmly in favor of the encouragement of domestic industry, they would seek to effect that object by the display of our manufactures at stated periods, in order to show what progress we were making, to enable the unprejudiced to compare our own productions with those of other nations, and to excite a proper spirit of emulation among our manufacturers.

In furtherance of the cause, they invited the manufacturers of Pennsylvania, and of the United States generally, to send the products of their skill, industry and ingenuity to an exhibition which was held under the auspices of the society, in Philadelphia, in October, 1824. This was followed up by an exhibition in the next year, when the Institute offered 68 prizes or premiums, among which were 48 medals of silver and two of gold, and it has since given many exhibitions of the kind. In two years the Institute had 1000 members. It established a course of free lectures upon science as applied to the useful arts, in connection with a practical course upon mechanics, and one upon natural history, founded a library, erected a public hall, instituted a monthly publication, which is still in existence, and from the time of its organization it has continued to be a most useful and valuable institution.

In 1827 the woolen manufacture of this State and of New England became clamorous for more effectual protection, as they called it, against foreign competitors. Conventions were held in most of the grain growing States, which resulted in a general convention of the friends of a protective tariff at Harrisburgh in Pennsylvania, at which resolutions were passed urging upon Congress the passage of the necessary law.

In the following year the American Institute came into existence. On the 19th of February, 1828, a small number of gentlemen met at Tammany Hall, and after adopting a constitution and by-laws they put forth an address to the public, disclosing their views and objects. They adopted a course exactly opposite to that of the Franklin Institute, and determined to co-operate by every legitimate means in their power to obtain a tariff of duties for the protection of domestic manufactures. And with the exception of the occasional reading of papers upon the rearing of silk-worms, the culture of the vine and other kindred subjects, the efforts of the society were at first wholly directed towards influencing public sentiment in favor of a protective policy. The society certainly exercised a powerful influence both upon the public mind and upon the action of Congress in securing the enactment of the tariff of 1828, but whether its efforts in this respect have been productive of benefit to the nation is a point upon which, at the present day, there is a wide difference of opinion, the greatest political economists maintaining that prohibitory laws are in their ultimate effects more injurious than beneficial to the nation that adopts them.

If the American Institute had done nothing more than to labor for what was then designated as the American system, the society would in all probability have ceased to exist after the passage of the tariff of 1828, and I would not now have the honor of delivering its 35th annual address; but following the example of the Franklin Institute, it entered upon a more practical field, and by doing so, in my judgment, laid the foundation of its subsequent continuance and prosperity. It instituted a fair or exhibition of the products of American industry, at first in the same way, but afterwards upon a principle different from the Philadelphia Institute, it invited manufacturers and others to exhibit their productions, and then gave honorary premiums, consisting of medals or diplomas for such among the articles exhibited, as in the estimation of the judges, were entitled to that distinction, whilst the Philadelphia Institute prescribed before hand and published a list of the objects for which premiums would be given. The fair was held at Masonic Hall, in Broadway, for three days, commencing on the 23d of October, 1828, and was highly successful. The expense was borne by the members, the public were admitted without charge, and the fair closed with an auction. The Institute was incorporated the following year, 1829, and gave its second exhibition on the 14th, 15th and 16th of October of that year, charging, as has since been the practice, a small sum for admission, and its success may be judged of from the following paragraphs in one of the leading newspapers of the day, the *Commercial Advertiser:* "Though frequently in a great crowd, says the editor, we were never so jammed as last night. Thousands had to go away without a sight of the Hall, we among the rest, after seeing a lady of large dimensions squeezed as flat as a pancake."

The Massachusetts Charitable Mechanic's Association was incorporated in 1795, and in the earlier years of its history was simply a charitable and social society. In 1818 it awarded premiums for the best made barrels and casks, but appears to have taken no further step in this direction until 1837, when it gave an industrial exhibition after the manner of the American Institute, and it has had repeated exhibitions of the same kind since.

In 1822 the Pennsylvania Agricultural Society was instituted, and gave annual exhibitions, consisting of animals, farm implements and agricultural machines, the first of which was held in 1823, and the next in 1824.

In 1831 the Mechanics' Institute of the city of New York, was established for the diffusion of knowledge among the mechanical classes, by means of lectures, a library and a mechanical museum; and this institution. in 1835, offered 120 premiums, consisting of gold and silver medals, for a series of articles to be exhibited at a mechanical fair, which was held at Castle Garden, on the 29th of September, 1835. This experiment was repeated the following year, 1836, a fair of the same kind being held at the same place, the number of premiums being increased to 154. This institution is no longer in existence.

In 1838, a large industrial exhibition of the same character as that of the American Institute, was given at Portland, in Maine, and in 1846 a national fair was held in Washington, for the display of American products and manufactures.

Before 1848, a society was organized in Rhode Island for the encouragement of domestic industry, which it has done, chiefly by getting up industrial exhibitions, and at about the same time the Maryland Institute was established at Baltimore, which for many years has had similar exhibitions.

In 1853 the Metropolitan Mechanics' Institute of the city of Washington, was founded, and gave industrial exhibitions annually for several years. The Mechanics' Institute and Library Association, of Tennessee, was established in 1855, and the society gave exhibitions at Nashville, of Southern products and manufactures, in the years 1855, 1856 and 1857. In 1856 the Kentucky Mechanics' Institute had a similar exhibition at Louisville, and in the same year the Agricultural and Mechanical Association, of Missouri, gave its first industrial fair at St. Louis. The second was held in the same city, in 1857, upon a very extensive scale, the large sum of $20,000 having been appropriated for distribution in premiums.

After the Legislature of New York had abandoned its system of rewards and premiums, an attempt was made to keep up the county agricultural societies, and in a few of the counties they were established and incorporated under special acts. To give greater effect to these local bodies, a general society was formed, to improve the condition of agriculture, horticulture and the household arts, which, in 1832, was incorporated by the title of the State Agricultural Society; and in 1841, an act was passed appropriating the sum of $8000 annually for the promotion of agriculture and household domestic manufactures in the State. It was, in all its essential features, a restoration of the old law of 1819, a specific sum being given to each county upon the same condition, the officers of the State or county societies being required annually to regulate and award premiums upon such articles, production and improvement, as they shall deem best calculated to promote the agricultural and household manufacturing interests of the State; the county societies being required to report their proceedings annually to the State society, and the latter body to the Legislature. The annual appropriation has been continued until the present time, the publishing annually the report of the State society, which has become a most valuable series, now extending to 22 volumes. Under this law the American Institute has received the sum appropriated to the city and county of New York, and the report of its Transactions has been printed annually by the State, in a separate volume, and by an act, passed in 1862, the old system of the early New York and Massachusetts societies has been revived, of collecting information in relation to agricultural and horticultural products, and improvements in the form of answers to printed questions obtained in every school district, by persons paid for that purpose out of the fund appropriated to the county agricultural societies. This plan of State and county agricultural societies, holding annual fairs in connection with the incentive of rewards and premiums, sustained in part by aid from the State, and organized under State laws, was adopted, after the example of New York, in Ohio in 1846, in Michigan and New Hampshire in 1849, in Indiana and Wisconsin in 1851, in Massachusetts and Connecticut in 1852, in Illinois and Vermont in 1853, in Tennessee and California in 1854, in Maine in 1856, and in Iowa in 1857, and the system may now be regarded as permanently established, its importance and value becoming more apparent with each succeeding year.

This, ladies and gentlemen, ends my narrative. It shows that the unexampled growth and progress of the useful arts, and especially of manufactures, since the middle of the last century, has been due mainly to these causes. Discoveries and inventions which have multiplied the ability, to produce, and lessened the cost of production. The dissemination of practical scientific knowledge among the working classes, greatly advancing the intelligence and skill of those whose labor has to be relied on. The incentive of rewards and premiums; the stimulus given by industrial exhibitions; and lastly, the passage of laws securing a patent right to inventors.

These means have been made effective in France chiefly by the aid of the government, and in Great Britain by the corporative efforts of societies, which are spread like a great net work throughout every part of the kingdom. In both of these countries the effort has been steady and continuous. With us it has been desultory and spasmodic. England and France, it is true, possess some natural advantages—Great Britain in her metalic and mineral wealth, and France in the fortuitous circumstances of a climate peculiarly adapted to the culture of the vine, the rearing of the silk worm and to the imparting of those brilliant dyes and colors which give to French fabrics their enviable superiority. But these nations, as my narrative will have shown, have not relied merely upon these advantages, but have done every thing which intelligence, energy and organization could do to stimulate the industrial arts in their respective countries. They have liberally and constantly kept up the system of offering rewards for inventions, discoveries or better methods, and to these rewards are due many of those discoveries in chemistry, which have been applied with so much effect in the useful arts. It is a prevalent opinion in the United States that these countries owe their present preeminence, as manufacturing nations, to the fostering influence of protective laws which they were able to relax or dispense with when their manufactures became firmly established. But my narrative, I think, will have shown that other and far more effectual means have been employed. Mill, the latest of English writers upon political economy, while condemning the doctrine of protection, generally, admits that an exceptional case may exist where a country is better adapted for some particular kind of manufacture than the countries which carry it on but has not the experience and skill of those who were earlier in the field. In such a case, he says, it is not to be expected that individuals should at their own risk and certain loss introduce a new manufacture and bear the burden of carrying it on until the producers are educated up to the level of those of other countries, and that a protective duty continued for a reasonable time will sometimes be the least inconvenient mode in which a nation can try itself, until it obtains the requisite skill and experience. He says the protection should be confined to cases in which there is good ground for believing that the industry which it fosters will after some time be able to dispense with its aid, and that the domestic producers should not be allowed to expect that it will be continued to them beyond the time necessary for a fair trial. This, in my opinion, is confining it to a case requiring what it is always difficult to obtain, very discriminating legislation. Protection is an advantage given at the expense of the nation, and where it is allowed for one manufacture others will be clamorous, as has been the case in this country, to have it extended to them. The principle being once conceded self-interest will lead to mutual co-operation, until a law is obtained, extending it a large variety of objects. If it be true, moreover, that a country is better adapted for a particular kind of manufactures than the countries which carry it on, the self-interest of individuals will soon discover it and be able to take advantage of it without the aid of protective law. The serious and permanent objection is that as protection raises the inferior domestic article to an equality with the superior foreign fabric, which is excluded by the heavy duty put upon it, there is no longer a motive to induce the native manufacturers to produce any thing better. As the foreign article can no longer enter into competition with him he contents himself with manufacturing and selling as much of the inferior domestic product as he can, and the only competition which arises is who will sell the cheapest below the artificial price to which the foreign article has been raised.

While such laws, therefore, are a great pecuniary benefit to the manufacturer, they do not raise the standard of the manufactures of the nation. It is curious to observe that the arguments made use of in our time in favor of a protective policy, are of the same general character as those employed in the middle ages in favor of the exclusive system of guilds, a system which, though designed to encourage trade and protect it, proved to be, in reality, one of the greatest obstacles to its progress. In fact, agriculture, commerce and manufactures have been more frequently retarded than benefited by legislation, as trade and everything which depends upon it, may be compared to the rivers that convey its products, which serve the great purposes of nature best when they are left to find their own way and work out their own channel.

In this country I fear that little is to be expected from government, and that which is done must be done as in Great Britain, by the corporative action of societies. Societies, however, depending solely upon the annual subscriptions of members, are involved in a constant struggle for existence, and unlesss they have an income derived from a permanent source, their future is always precarious. The London Society of Arts has this security in numerous legacies, which have been left to it by enlightened individuals, who have had the sagacity to see the importance of extending the sphere of a society, the aim of which has been the development of new sources of national wealth, creating thereby new fields for the employment of labor; a course as much to be commended as leaving legacies to charitable institutions, whose office it is to relieve that poverty which springs, in so large a degree, from the want of employment. The bounty which is bestowed to prevent poverty, being a more enlightened and comprehensive charity than the alms which is merely given to relieve it when it exists.

We have become a great agricultural and commercial nation, and as we are a very inventive and ingenious people, with an especial aptitude for the mechanic arts, there is no reason why we should not also become a great manufacturing people. To do so, however, we must resort to the same means that other nations have employed, and I have sufficiently indicated what these means have been.

This metropolis is the commercial, the monied and the industrial centre of the country. It was the first city upon this continent to advance the useful arts by the offer of rewards and premiums; the first in which an industrial exhibition was given, and through the exertion of your society, the only one in which it has been annually kept up. Here, then, is the appropriate place for a powerful society to accomplish this great object, whose ramifications should extend throughout the Union; a society wielding the same influence and producing the same effects as the London Society of Arts, or the society for the encouragement of the National Industry at Paris.

To raise the American Institute to this high a position is an object worthy of your ambition, and it is one that may be attained in the course of years, if you should steadily direct your efforts towards the securing of a permanent fund and the erection of a hall adapted to the purposes of your organization. These are two steps essential to give you the assurance of permanency. I understand that you have already an amount sufficient for the erection of a public building, and the corporation of this city, with a view to the interest of the city alone, could not do a wiser act than to give you the land upon which to erect it. For the rest you must depend upon your own exertions and the liberality of individuals. In going over your history, I am surprised, in view of your limited means, and of the great labor and expense attending the getting up of industrial exhibitions, that you have been able to accomplish so much. Your past is therefore a promise of your future. You have a great end before you; and in respect to it, I would close by interpolating a couplet from an old English poet:

Attempt that end and never stand in doubt;
High though the aim, a will will work it out.

PROCEEDINGS OF THE FARMERS' CLUB.

RULES AND REGULATIONS OF THE FARMERS' CLUB OF THE AMERICAN INSTITUTE, ADOPTED BY THE COMMITTEE OF AGRICULTURE.

1. Any person may become a member of this Club, and take part in the debate by simply conforming to its rules.

2. Any member, for disorderly conduct, may be expelled by a vote of the majority.

3. The minutes of the Club, notices of meetings, etc., shall, as formerly, be under the control of the Secretary.

4. The Club shall be called together Tuesday, at 1½ o'clock, P. M., of each week.

5. A chairman pro tem. shall be chosen at each meeting.

6. The first hour of the meeting may be devoted to miscellaneous subjects, as follows: papers or communications by the Secretary, communications in writing, reports from special committees, subjects for subsequent debate proposed, desultory or incidental subjects considered.

7. The principal subject of debate shall be taken up at 2½ o'clock (but may be introduced earlier by a vote of the meeting), and continue until 3½ o'clock, unless a motion to adjourn prevail.

8. No person shall speak more than fifteen minutes on the principal subject, unless by consent of the meeting.

9. All controversy or personalities must be avoided, and the subject before the meeting be strictly adhered to.

10. Questions pertinent to the subject of debate, may be asked of each through the chairman, but answers must be brief, and not lead to debate.

11. The chairman may, at any time, call a person to order, and require him to discontinue his remarks.

12. When any committee is appointed by the Farmers' Club, the members of said committee shall be members of the American Institute.

13. No discussion shall be allowed that is not connected with the great subjects of Agriculture and Rural Improvement.

May 5, 1863.

Mr. Edward Doughty, of Newark, N. J., in the chair.

MELON SEEDS FROM THE AMAZON.

The Rev. J. C. Fletcher, Missionary of the American Sunday School Union, in Brazil, presents, through Mr. R. G. Pardee, seeds of choice watermelons, grown upon the Amazon, from 400 to 1,100 miles from the mouth. These were distributed among the members who will try the experiment of producing them here. Mr. Fletcher thinks they would certainly grow in New Jersey, as the region where they grow on the Amazon, though in a tropical latitude, is of a mild temperature. The quality is said to be exceedingly delicious.

Wm. S. Carpenter presented seeds of one of the mush-melon family from Japan, grown by him last summer, in Westchester county, which he thinks the very best of this variety.

Seeds of a New Tea-Plant.

Solon Robinson presented the seeds described in the following letter, which Mr. Carpenter was requested to take charge of. Charles A. Perdue, of Inland, Summit county, Ohio, writes: "I inclose a few seeds of a perennial evergreen vine, growing wild on Fidalgo Island and other places on the Pacific coast, in Washington Territory. The plant is used there by the inhabitants as a substitute for tea; is said to have a fine flavor. I have just received it from my brother, who has been a resident there for several years. I also inclose a specimen of the plant. I suppose, from his statement of the climate there, it would need some protection in the winters of this latitude."

These leaves are about the size of tea leaves, and are extremely pleasant to the taste and smell, and we have no doubt they would make a tea quite as pleasant as much of the stuff sold here at a dollar a pound.

A Seedling Magnolia.

Wm. S. Carpenter called the attention of members to a seedling of a Chinese magnolia, now ten feet high, hardy, upright growth, very prolific of magnificent, fragrant flowers, double and compact, about twice the size of a hen's egg, white, slightly pink at the base.

A New Fibrous Plant.

J. H. Moorehead, of Ida, Iowa, writes as follows:

"Inclosed I send you a sample of fiber of a plant that grows very abundantly in this region of Iowa, on what is termed weed land, extensive tracts being covered with it.

"The sample sent was stripped from the plant by simply breaking the woody substance and drawing the fiber from it. The plant having stood during the winter where it grew. The growth is from three to five feet in height, and about as large as a common penholder.

"At the present time, when wool and cotton are worth from 80c. to $1 per pound, and material for paper is scarce and high, this may be used for some good purpose. From my recollection of the plant it is a kind of nettle, but of this I am not certain. If you can give the name of the plant, or if considered of any value, state what, you will oblige me."

Dr. Trimble thought he recognized the fiber as that of a plant that used to grow upon the Brandywine river, and which he had often thought might be a valuable one to cultivate.

No one present was able to give any valuable information about the plant, but it was generally conceded that it is the best of all the specimens of fiber from wild plants that have been sent here, and the hope expressed that Mr. Moorehead will try what would be the result of cultivation, and, if favorable, take measures to have seed saved and distributed. If he will send specimens of the plant to Wm. R. Prince, Flushing, he will ascertain the proper name and class to which it belongs. If such fiber, as the sample sent, can be gathered in quantity from the plant growing wild, we have no doubt it would sell to paper-makers, at such a price as would pay far better for the labor than growing corn in Iowa.

The Oat Aphis.

Mr. Carpenter, in answer to an inquiry whether this pest of the farmer is likely to abound this season, said he believed it would. It was very destructive to oats and wheat last year in the eastern part of Westchester county, and he now discovers that the young willow-shoots that grow along the streams are covered with aphis, which he supposes to be the same kind that destroyed the grain last year, as Dr. Fitch, entomologist, says that they are often found upon the early willow buds, and upon other plants before their favorite food, oats and wheat, is forward enough for them to depredate upon. If they increase in proportion this year as they did last upon former years, farmers will have to abandon the cultivation of small grain where this pest abounds.

Dr. Trimble doubts whether the aphis now found upon apple and willow buds is the same that destroys oats, because there are a great many varieties, and some attach to one species of plants and some to another; and he does not think it would be good policy for a farmer to neglect to sow grain because he saw aphides upon willows; nor is it worth while to despair of growing grain because these destructive insects are troublesome this year—they may not be so next year, they have so many natural enemies. The ichneumon flies may be so numerous as to destroy the aphis in one year. As for a cure of the pest, there is none. Man is powerless against such a tiny foe. He must wait patiently for time to bring the remedy. Lady-bugs and birds feed upon aphides, and inchneumon pierce them with their ovipositors, and thus they are destroyed. I can manage the curculio; I cannot the aphis; but there is a power that can and will. Let us not be discouraged.

Ants and Beetles—Remedy.

Mr. Pardee read a receipt sent him from England "to destroy ants and beetles." It is to dilute sulphuric acid, and slack lime, say half pint of acid to half a bushel of lime, and put the powder in holes infested with ants or black beetles.

Prof. Mapes thought that lime prepared in the way recommended could not vary materially from common plaster of Paris—sulphate of lime.

Bugs on Potatoes—Do they Cause the Rot?

A. Hogeboom, of Shedd's Corners, Madison county, N. Y., asserts dogmatically that the sole cause of decay in the tubers is a bug upon the vines. As his letter contains some practical hints upon cultivation, we give it entire as follows:

"I am greatly pleased with your short cut of disposing of the subject of a sure panacea for the potato rot. It is time we were rid of this mooted subject. Nearly twenty years ago I published what I knew to be the cause of the blight of this valuable esculent. I will not trouble you with my method of testing unmistakably the cause of the disease.

"*Positively* it is nothing more nor less than the poison infused into the juice of the vine by a little black bug. All other theories are simply utopian, that divert attention from all there is of any practical utility in the treatment of the potato blight. The fancied discovery of any absolute preventive capable of a general and economical application, is a delusion. There are precautionary methods, simple of comprehension, that are of immense value.

"There may be a difference in the qualities of the different varieties for resisting the deleterious effects of what is to the potatoe the poison, if I may so express it, of these little depredators. But the great practical desideratum is to get just such a growth and no more, as will insure something like a fair crop, for the more luxuriant the growth the tenderer the vine—the quality which attracts the bugs. Wet and warm seasons, or too moist and rich land, or the presence of manures, cause rapid growth, and invites the ravages of the bugs. The vines of some varieties, too, are more palatable to the bugs. All this is to be adjusted by observing the phenomenon under different circumstances.

"I always use ashes and nothing else; dusting them, as much as convenient, all over the vines in the hill, and I can succeed tolerably well on rather rich soils, if light and dry, by applying the ashes occasionally, when they have been washed off by rains.

"After many years experimenting, I have adopted the habit of digging as soon as the vines are mostly dead. Have the potatoes as dry and free from dirt as possible. Place them in shallow bins, raised a little from the ground; and don't neglect to hunt them over carefully a few weeks after digging, that the affected ones may be removed. These may be fed to cattle or swine and not lost. When thus sorted over, they may be put into heaps, somewhat; some say sprinkle among them charcoal. It may be good, as tending to neutralize the latent effects of the insect's saliva. The ashes on the tops, or vines, may have this effect to some extent, or they may not. I apply ashes to drive the bugs from the vines, especially in the earlier stages of their growth."

Dr. Trimble.—I wish Mr. Hogeboom would send us some of his potato bugs, and let us see which of the family it is that produces this disease, as there are many different insects that live upon potatoes. Who can tell which we are to regard as friends and which as enemies? Look at the variety that has already appeared on plants this spring. Mr. Carpenter says that one of the potato bugs eats all the substance of the potato leaf, and that affects its vitality. What has that to do in producing the rot. The same thing occurred long before the rot was known. One man says positively, that he knows that the curl disease of peach trees is occasioned by a particular worm. Somebody else knows exactly the contrary. It is the same with this potato bug theory. Mr. Hogeboom's theory may be correct, but I doubt it. If he knows, he knows more than I do, who have been trying to learn something about insects for the last twenty years, and after all, I am free to acknowledge that I know but little.

A long discussion followed upon the curculio question. The general conclusion was, that all washes recommended as specifics are worthless; that plum trees growing in lots where hogs run and root a good deal, are more likely to produce fruit than in other places, and that the stiffest clay soil is the best for plums; and that the only sure remedy is to jar off the insects upon a sheet and kill them.

STRAWBERRY BEDS—SHOULD THEY BE CULTIVATED?

This question was pretty fully discussed, with the conclusion, in the affirmative that the best results are produced by digging and working strawberry beds. The hoeing should be done before the plants blossom, and then be allowed to rest until after the fruiting season.

Mr. Carpenter said ashes is the best manure. Bone dust is good, and so is superphosphate.

Prof. Mapes.—The great want of the strawberry plant is potash, and the great want of fruit is tannic accid.

Dr. Trimble.—I find the best result in allowing the vines to run into new ground, and then turn over the old bed and manure it, and then let the runners cover it again with new plants, and so alternate. I find the Bartlett one of the best strawberries that I have grown.

Mr. Carpenter said that strawberries are supposed to exhaust land rapidly, but Mr. Knox, of Pittsburg, thinks that they do not injure grape vines when grown among them.

Prof. Mapes.—I do not know that strawberry vines will injure grape vines, but I am sure that they are seriously injured by growing rhubarb near them.

PRESERVING SNAP BEANS FOR WINTER USE.

Prof. Mapes stated that snap beans, if pickled in a dry day, and packed in dry, fine salt, will keep in the same condition through the winter.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

May 12, 1863.

Mr. Norman Francis, of New York, in the chair.

GOOSEBERRY BLIGHT IN INDIANA.

Jason Hubbell, Jervis, De Kalb county, Ind., writes, May 4, and incloses a gooseberry twig, with leaves half inch across. He says:

"I inclose a stem of an English gooseberry; it is early and vigorous in the spring, blossoms full, grows very encouragingly until some time in June; then mildews, leaves crisp, fruit drops—none ever come to maturity. Can the club give a remedy? It stands in clay soil well manured."

Prof. Mapes.—I do not know as it will prove a complete remedy in the case named, but I do know that I have found it to my advantage to cut out branches so that none will grow nearer than five inches apart. This is for the purpose of giving a good circulation of air through the branches. I also find mulching beneficial, and the best material is salt hay, which I cut fine in a chaffing machine.

Dr. Trimble.—I suppose all this is beneficial, but how shall we account for the fact that some persons do grow gooseberries without any apparent effort? I know one man in Newark, who has his bushes growing promiscuously all about the garden, some of them under trees, with but little care, and he always has good fruit, while mine and others that are well cared for mildew seriously. I mulch mine with salt hay, but it does not cure the disease. I would recommend the adoption of the native American varieties.

John G. Bergen.—I have never been able to prevent the disease. One man told me that the best thing in the world was brine. I tried that, and it certainly prevented the bushes from midewing, for it killed the whole lot. Salt hay may be the best mulching in the world. I recommend it because it is the cheapest.

Solon Robinson.—Do you recommend it in all cases? Because, if you do, I should wonder whether it would be cheap for the man in Indiana. I do not believe that the grass on the prairies, nor around Lake Michigan, is salt enough to answer the purpose.

Prof. Mapes.—As to the quantity of salt in the sea-marsh hay, that can have but little effect, as I do not suppose there is more than a pint in a tun of the hay. It would be very easy to add that amount to fresh marsh hay.

INSECTS INFESTING FRUIT TREES IN WISCONSIN.

T. R. Darrow, Brandon, Fond du Lac county, Wisconsin, writes May 3: "I send to your club specimens of a louse that has covered some of our apple trees. Will some of your members tell us a cure for this pest?"

Miss Almeria L. Bliss, Liberty, Kenosha county, Wisconsin, writes May 4, as follows:

"My father desire me to address you in regard to some new insects, or else a new disease of fruit trees that he discovered this spring, while trimming. Many of the small twigs of the lower limbs of the apple trees appear to the eye, as you will see by inclosed specimens, as if punctured in many places with a penknife. The bark rolls up at the edges, giving to very young twigs the appearance of age. On cutting into the incision with a knife, it is found to extend into the wood, and to be filled with small white nits or eggs of an insect. Not all the apple trees in the orchard are so, but many are. We have discovered the same appearance in pear trees, only on dwarfs in the door-yard. This is something entirely new to us, and you may be sure we are very curious to know what it is, whether it has appeared in other places, and what injury it will do the trees? Please lay the matter before the Institute Farmers' Club, and have it discussed, and we shall probably see the report of the discussion in the *Tribune.*

Dr. Trimble.—I am not able to discover anything in these twigs without the aid of a strong magnifying glass. I will take them home, examine and report at the next meeting. As to the dust in the other letter, I find the eggs of a bark louse. The cures for the pest are various, but none of the nostrums recommended are sufficient. Some say that gas tar, or other offensive smells will keep them off. I do not believe it.

John G. Bergen.—I would sooner trust to keeping the trees clean with a potash or caustic soda wash. The brine of mackerel, put on with a brush, is said to be a good remedy. It is easily tried.

Prof. Mapes.—I had a heap of spoiled fish decomposing, and no insects could be found near it.

Flax Cotton—Information Wanted.

Mr. Jason Hubbell, of De Kalb county, Indiana, says:

"What benefits, either morally or otherwise, have mankind received from the cultivation of tobacco, which in 1850, amounted to 429,390,771 pounds? or from the manufacture of alcohol, to the value of $24,253,176? And why introduce the poppy, encourage its raising, manufacture of opium on an extensive scale? Let us know the benefits to be derived from this vast amount of labor thus expended. We imported in 1859 $31,000,000 in sugar, 30,000,000 gallons molasses, which we should produce at home. We greatly need information for raising and making flax cotton, in all its various processes. This we should prefer to tobacco culture, which many are going into largely. By understanding the real merits and demerits of these several branches of labor, I think the morals, as well as the interest, of the farmer might be promoted."

Solon Robinson—This letter was elicited by our discussions here, deprecating the culture of tobacco, which appears to be extending all over the United States. In one of our late reports, I gave much information upon the subject of flax cotton, so that I do not propose to enlarge upon it at this time.

When to Plow Under Green Crops.

Nathan Vose, of Grant, Lake county, Illinois, gives the following practical information:

"In *The Semi-Weekly Tribune* of the 21st of March, I noticed under the head of the Farmers' Club, "that oats and broom corn are condemned as worthless as manure plowed under green crops.' Whatever the Farmers' Club say is generally beyond question, and the above decision may be correct, but I wish to give a few facts, which may modify your decision. Several years ago, when breaking up the virgin soil, we quit plowing in July, on account of the drouth. The land was what is here called oak openings; some of it clayey, and some black soil. We had plowed a strip about a rod wide, on the land we were at work upon, when we quit. The land had been pastured, the grass was short, and dried up, but wet weather ensued, and in September, when we finished breaking, the land was in good order for plowing, with a good growth of grass. I sowed the whole to spring wheat. On the land broken, previous to August, the wheat stood about four feet high, and gave about 25 bushels to the acre. On that broken in September, it stood about 18 inches high, and gave about six bushels to the acre. That strip, a rod wide, was visible as far as the eye could reach, and remained so for three successive seasons. My September breaking of that year was my last experiment in that line. Now, is it not possible that the use of plowing under the oats and broom corn has something to do with the result? Clover is ready to turn under in June, and as far as my observation and experience goes, a very scant crop of weeds turned under in early summer, is highly beneficial; while a heavy crop of grass or weeds plowed in late in the summer, or fall, is useless.

"Oats and broom corn may be worthless as manure plowed under as a grass crop, but I suspect the fault is in their time of maturing, and not from any unfitness or intrinsic fault of the plants."

Solon Robinson—This sensible letter is in exact agreement with my experience in farming upon the prairies of Indiana, and I have no doubt the theory is correct—that a very light crop of clover, turned under in June, is better than a heavy one in September.

This letter awakened a good deal of interest, as the doctrine advanced that green sward or green crops for manure, should only be plowed under in the fore part of summer, was new to several of those present, and if the theory is correct, it is very important that farmers should know it, and act accordingly.

Prof. Mapes said that it was a well ascertained fact, that the juice of young plants has more power to decompose matters in the soil, which serve to fertilize it, than that of more mature plants.

John G. Bergen—If the theory is correct, the common practice of turning under green sward in autumn, should be abandoned.

Tools to Cultivate Tobacco.

John B. Elliott, New-Harmony, Indiana, wants to know how they are to cultivate all the tobacco that is being planted in that section, having never been accustomed to use a hoe for anything more than stalk-cutting, covering corn, &c. "No hoed crops have heretofore been raised here, in consequence of which we are very deficient in tools required for such purposes. There will be great quantities of tobacco and cotton planted here this year, and much more would be, were it not for fear of the great labor of hoeing with our common implement. Will you be kind enough to let me know the name of the best implement for the purpose of hoeing tobacco or cotton? The price? Where to be had? I know the old corn hoe is good as far as it goes, but has not enough of the go about it to suit scarce and expensive labor. Will the tools mentioned in your Club as the Carrot-Weeder, Langdon's Cultivator, &c., work as well on land ridged by ploughing four furrows together, as the cotton-scraper, such as is used in the South, and will they dispense with any considerable amount of hoeing in a tobacco crop?"

Prof. Mapes—I really believe that one smart man and horse, with proper tools, can do more work than fifty men with hand hoes, taking into account that the work is so much better done by a horse hoe than it can be by hand. The Langdon cultivator has been modified and superseded by several others. The one known as Knox horse hoe is retailed at about $8.50; another, called Armsby's, $6. There are three sizes of carrot-weeders, cutting from twelve to twenty-four inches, price $4, $5, and $6 respectively; an expanding cultivator, $9. These tools can be found at any large agricultural warehouse, and for the culture of cotton are far superior to the old "cotton sweep."

Grape Vines in an Orchard.

C. B. Darrow writes to the Farmers' Club for information. He asks:

"Would grape vines and apple trees do well set together; apple trees

30 feet each way, and grapes in rows to form a trellis between each row of apple trees. Should grape vines run north and south or east and west, and how thick in the row should they be set? What variety is most trustworthy for a good wine grape for the latitude of Northern Indiana? Should like to hear talk about the Oporto and Delaware compared as a wine grape. I have a young orchard just set on a good piece of gravelly loam, pretty well prepared, and for want of other room should like to fill it up with grapes, if it will pay to do so."

Solon Robinson—I commend this man, and I think that all the members will agree with me in this, to take "Landmarks," the new paper published by Dr. Grant, "Iona, near Peekskill, N. Y.," as the best guide that he can have upon grape culture. If he reads that, he will not plant grapes and apple trees together, and when he knows both, he will not plant the Oporto anywhere for a vineyard.

Dr. Trimble—Yes, all will concur in that recommendation; that work will teach him how and when to plant, what sorts are best, how to cultivate, and all about the business.

John G. Bergen—I have no doubt that he may plant vines in an orchard, as suggested, and get several good crops of grapes before the trees grow large enough to interfere with the vines; but he would then have to sacrifice his vineyard, just as it became profitable. As to the direction in which vines for a trellis should be set. I have some rows planted to run north-east and south-west, and others north-west and south-east, and I do not find any difference. I do not believe it is of any importance what direction is given to the rows.

CALCINED SAND TO PRESERVE APPLES.

J. H. Garretson, Richland, Keokuk, Iowa, says:

"I have tried most of the materials spoken of by members of the Club, and think surely they have never tried *Calcined Sand*, or they would not recommend anything else where fine sand could be readily procured and cheaply burned. It has many advantages over all other materials, such as oats, chaff, cut straw, hay, buckwheat hulls or rice hulls, and I know of no objection to its use."

Prof. Mapes—This will depend entirely upon what he calls sand, as some substance called so contains much carbonaceous matter, and would be improved by burning. Pure beach sand needs only to be dried. Burning would not alter its character. Coral sand would destroy instead of preserve fruit, and so would the green sand (marl) of New Jersey. The debris of some rocks is called sand, and soils which contain much other matter, are also called sand.

NIGHT SOIL AS MANURE.

E. G. Waters, Coventry, Chenango county, N. Y., says: "I consider night soil, in its crude state, useless as a manure. With soot I can deodorize it about as fast as it is mixed. In this state it is a good fertilizer?"

QUEER NOTIONS ABOUT GRAFTING.

Mr. Waters also says: "I think you will yet be satisfied that a sweet and sour apple can be grown by splitting the bud. I have good evidence that such a tree is now growing a few miles from me. I have seen an apple with the core growing in detached portions on the outside and sound in the center. This was caused by the scion being set top downward."

The recommendation to use soot as a deodorizer, was approved. The idea of producing compound fruit by splitting the bud, was considered by all present as simply ridiculous; and as to producing an effect upon the fruit by setting scions top end down, it was thought that it would be quite as likely to make it grow on the roots instead of top, as to produce the result named.

WHAT WILL CURE POTATO THEORISTS.

Solon Robinson.—Can any one tell me how to cure a disease that is worse than the potato rot? It is the theory disease. It is something that affects the imagination of people, so that they conceive themselves entirely competent to cure the potato rot, and at once advance their theories, which are indentical with others that have been repeatedly exploded. Every week I tell these visionaries that we do not want any more letters upon the subject, unless the writers can advance something new. Every week I kick a parcel of letters under the table, and tell writers that I will serve theirs in the same way; but it is all no use. I had rather undertake to cure the incurable potato rot than to cure the potato-rot theorists. Last week I read a letter here from a man who *knows* that the disease is caused by insects. Here is another from Wm. M. Hoyt, of Onondaga, N. Y., who says:

"I believe it is a conceded fact with most of our experienced cultivators that the rot is *not* caused by an insect, but by an atmospherical action on the leaf, and then communicated through the stock to the root and tubers."

And so he writes four long pages to prove his theory, and that the cure of the disease is early planting. It is not a very new theory, nor is it infallible. Until such a one is discovered, I wish theorists would keep their own secrets, and save their pen, ink and paper.

Dr. Trimble.—Yes; I can tell you how to cure them. It is only to keep your promise, and never notice in any way a single letter written to you upon the subject. These theories about the potato rot have become intolerable bores.

THE "AGRICULTURAL DEPARTMENT."

The committee to which the subject was referred of letters describing fruits and valuable plants indigenous to the wilds of Minnesota, Wisconsin, and other parts of the north-west, have duly considered the subject and report:

The committee feel the force of the suggestion that that region affords a rich field for exploration and work that properly belongs to the Agricultural Department at Washington, and in the opinion of the committee an appropriation to defray the expenses of competent persons to make such explorations would tend to the credit of our American institutions; and therefore the committee ask the Club to adopt the following resolution:

Resolved, By the Farmers' Club of the American Institu te, that we re commend the Agricultural Department at Washington to employ competent persons to search after and collect neglected American fruits and plants that appear likely to be valuable, and test them in cultivation, and report thereon.

A New Hay Rake.

Solon Robinson.—Here is a letter from Jas. W. Henry, Cortland county, N. Y., with a drawing and description of a new contrivance to be used in hay-making, which he wants me to lay before the Club. I do it, without pretending to understand its merits, if it has any, and as I have no time to inquire into it, I hope the Club will refer it to some one that has.

Prof. Mapes.—A number of machines have been invented for this purpose. Mr. Nourse, of Massachusetts, has made a number of experiments to produce a perfect machine for the purpose of raking hay.

On motion, the subject was referred to Prof. Mapes to examine and report.

Questions for Discussion.

C. C. Funk, Reedsburg, Ohio, proposes the following questions for discussion by the Club:

"How can we prevent young fruit trees from being injured by locusts? This is expected to be locust year in this part of the State.

"If we, in a soil of sandy clay, turn down a sod of a dark color, and in two or three years turn the soil again, why is it a yellowish color, and what effect has the color on its fertility? The same effect found under a pile of straw or manure.

"Is well-rotted wood (especially large trunks) good for preventing strawberry runners? And is it not an excellent manure for gardens and fruit trees when it becomes mold?"

He also makes the following statements respecting crops:

"Wheat looks very badly, seldom worse than this spring, but there is considerable old wheat kept by farmers.

"A great breadth of barley and flax sown, but not so much oats as usual.

"Farmers are more energetic and industrious than a year ago, and, of course, more hopeful."

Locusts.

Dr. Trimble made a statement of localities where the locusts will appear this year, and he asks persons in each of the places to note the exact day of their appearance, and send reports to this Club. From his own observation, he is satisfied that these insects always come out of the ground at evening, and they are then in a very helpless condition, but cast their shell and become lively the next morning. As to injuring plants, he does not believe they do above the ground, but in all the long years of their life below ground, they live upon the roots of trees, and from a record kept by two farmers near Rahway, N. J., for sixty years, they are satisfied that their crop of cider regularly diminishes toward the period when the locusts are to appear. This Dr. Trimble thinks perfectly reasonable, as they come out of the earth very fat, which they must have gained from some kind of food, and he believes that food is derived from the roots of trees. They eat nothing above ground, but when very abundant, they sting the twigs to such an extent that they sometimes die, and thus disfigure trees. The subject will be further considered at the next meeting.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

May 19, 1863.

Mr. Adrian Bergen, of Long Island, in the chair.

The secretary read a communication from Mr. Wm. Marsh, United States Consul at Altona, Duchy of Holstein:

U. S. CONSULATE, ALTONA, *April* 22, 1863.

To Gentlemen of the American Institute Farmers' Club:

Gentlemen—I am just returned from a trip through the Duchy of Holstein, and being somewhat interested in the debates and valuable information gathered from your Club, hasten to inform you of the favorable appearance of vegetation in this fat old province. We have had here a remarkably mild and open winter. And now after a spell of six weeks of fine sunshine the trees and hedgerows are in full leaf nearly, and the homestead of the Holstein peasant is a paradise of blossoming fruit trees, promising a bountiful bearing as a recompense for his industry. The farmers have taken advantage of the fine weather, and the breadth of their spring crops (I am informed), is larger than last year. Barley sown three weeks ago is up, and looks very beautiful, with dark rich healthy green. The tillage used for this crop is generally pulverized bones, which is usually drilled, or sown broadcast with the seed and plowed in. Barley is one of the safest and most profitable crops in this section of Germany.

Winter wheats look well, and the late prevailing easterly winds and occasional showers promise a heavy crop. Taking the whole face of Holstein, as viewed at this time, everything seems very promising. There is, however, fully three months and a half of casualties to encounter before harvest, and what may happen in that time none can know but the Divine Creator. As I am occasionally visiting the country and passing through the most fertile part of the Duchy, I shall have much pleasure in dotting down any useful information gathered from these tours, and communicate them to your very useful Institute Club. I receive the *Weekly Tribune* at my Consulate regularly, and there I read of the experiments in horticulture and agriculture spoken of and discussed at the American Institute Farmers' Institute.

I have the honor to remain, gentlemen,

Yours very truly,

W. MARSH.

THEORY OF THE CLIMATE.

Mr. John G. Bergen.—This letter reminds me of the theory of the weather that I have long observed—that a late, cold, backward spring upon this side of the Atlantic is always the reverse on the other side. I notice that in England farmers never had a better season, and that all spring crops are forward and good. And this subject induces me to offer the following extract of a letter lately received from the Bahamas:

"There are no wild animals on these islands, except a small rabbit or coney, and rats and mice. Of domestic animals they have horses, cattle, sheep, goats, hogs, dogs, cats and asses. All these, and the rats and mice, have been imported. It is a fact quite obvious that none of these flourish here. They have the domestic cock and hen, Guinea hens, pea-fowl, geese, ducks and turkeys. None of these thrive but the common hen and Guinea hen varieties. For these two kinds of fowl the climate is admirable; but food is scarce, except so far as it is made up of insects and reptiles. The hens lay, and hatch, and multiply, and are healthy, but they are never fat, and never fatted—but they might be.

"I will state some facts that it would be well for all who raise stock to consider when choosing location for cattle-growing, or rather stock raising. In the early days of the Bahamas, when slavery existed, these islands were occupied by proprietors who were able to, and who did, import a fine stock of English and Spanish horses; they gave much attention to breeding, had races and fairs. The imported horses were of the usual size and form of the English and Spanish breeds. Now the native-grown horses, descendants of this stock, are mere ponies, eight or ten hands high, light in body and limb, and miserable in form. The same change is as marked in horned cattle. They are even more changed and miserable than the horses, and there are reasons why the horse should have deteriorated the most rapidly, which I will not stop to supply. Sheep have rapidly deteriorated, considered as wool-bearing animals. They have a little coarse wool, that little on the back, but on the legs, belly, flank, and well up on the sides the covering is hair, not better nor different from that of the goat. I have been assured that an individual sheep imported here will in a short time, and during the life of that individual, suffer a change of wool to hair. This I doubt, and find no means of verifying; but that in a few generations sheep cease to bear wool here is obvious on all sides. The body of the sheep becomes slender, his legs long, and he becomes black or reddish brown. The mutton is of good flavor, perhaps because it is never fat, but whether from that cause or not, the mutton is good to the taste.

"Hogs are almost universally black and small, the flesh soft and strong. It is said white hogs do not thrive, the sun cracking and producing disease of the skin. The hogs run to head amazingly, and the hind-quarters dwindle to a point, assuming rapidly the form of the wild hog. Asses and mules are growing small, like the horse stock, and are now so small as to be of little worth for draft animals, and quite too small for riding. The goat here as everywhere is least affected by adverse circumstances, but even the the goat is inferior to ours, and is by no means the happy philosopher he is with us. Dogs, whatever the blood, degenerate into curs. I take the Bahamas to be a situation extremely unfavorable to the growth of horses, cattle, sheep, hogs and asses; by reason doubtless of the climate, they all deteriorate. The conclusion is, that this climate and such tropical climates are to be avoided entirely by the stock-grower; and as for sheep, the argument of a cold climate for fine wool is helped by this extreme illustration. The cocoa nut tree flourishes here, and the rat has a habit of climbing it, eating an opening into the cocoa nut, making his house there, and living on the top of the tree, though limbless, sometimes for 60 feet, from the base to the crown. The other fruits that flourish are the orange, the pine apple and the banana."

A New Butter-Worker.

Mr. P. G. Woodard, of Waterford, Penn., presents a cut of a butter-worker patented by him, which looks well on paper, and as though its action would be exactly that of the hand ladle. The butter being laid upon a table, with only inclination enough to carry off the milk, is acted upon by a fluted roller that moves back and forth, the pressure being regulated by springs, so as not to mash or rub the butter, but cut it apart again and again until all the buttermilk runs out by a gentle pressure. Butter workers should understand that in using a ladle or machine, butter must never be worked with a stroke like that of a mason in plastering.

Theory of the effect of the Moon on Plants and Animals.

Thomas Nelson, of Winona, Illinois, writes as follows :

> " Be not among the first by whom the new is tried,
> Nor yet among the last to lay the old aside."

I do not remember having seen in the reports of the American Institute Farmers' Club any decision, from experiment or otherwise, on the effect of the moon upon vegetation. If this may not be considered all humbug, I know you would confer a favor upon a credulous public by giving some authoritative decision of the Club. I know that some of your members will smile, but it is well known that beans and peas planted at certain seasons will blossom till frost, and have both ripe and green pods at the same time.

A friend in Greene county, N. Y., once said to me he would give almost anything if he had kept a diary, or had any means of knowing the time he sowed a field to peas, as it was an enormous yield without extra culture, and the only good crop he ever had raised of them.

A neighbor called on me a few days since, and, said he : I never have any luck raising potatoes, while my neighbor, an old farmer who "plants in the moon," never fails, and is planting to-day. Of course I left other work, and went to planting mine. So much for my own credulity. If you, or any one, wishes I will give the time and the result of the experiment in the fall. I also wish to ask your opinion of the effect of the moon, and the signs upon the weaning of young stock, &c. Perhaps this may draw out suggestions, and other items of a similar class, with answers to questions, which I need not name. I presume you get weary reading so much trashy correspondence—asking so many foolish questions. If so, I imagine if you should request such, to inclose a fee to entitle them to notice, their number would be perceptibly less.

Solon Robinson—Mr. Nelson certainly has not read all the proceedings of this Club, or he would have seen that this moon theory of effect upon animal and vegetable life has been pretty thoroughly ventilated, and that there is a mass of evidence to show that the moon has no influence whatever. Numerous careful observations have been made, all of which go to prove that the effect upon a crop planted at any particular period of the moon, is just the same as commencing a journey, voyage, or piece of work, on Friday; the result in both cases, is all in the imagination.

John G. Bergen—Many years ago my father determined to thoroughly test this moon theory, then so prevalent among the old Knickerbocker people in this vicinity, and he planted, sowed, and did everything that he could in exact accordance with the moon theorists, and exactly the reverse, and finally became fully convinced that the theory of the moon's influence could not be sustained. I believe that the same result has been arrived at by every careful inquirer after truth, uninfluenced by preconceived opinions.

Remedy for Striped Melon Bugs.

A lady who writes from Farmersville, Cattaraugus county, N. Y., says:

"Place lime in an unbroken circle around the hills, the first fair weather after they are up; it will prove an effectual barricade, unless your bugs are braver than those of Cattaraugus."

Another person says:

"I procured dust from the smut machine of a flouring mill, and when the striped bugs attacked my vine, this dust was sprinkled freely on the hills as an experiment. It was a perfect success. The bugs seceded at once. It requires renewing only when rains wash it off."

A member read an article suggesting a coop of chickens to keep off bugs. Place the coop in the melon patch, to hold the hen, letting the chickens run at large.

The Rev. Mr. Weaver, of Fordham, said that he had tried that plan, but it was not effectual. Soot, or any dust, does good if you take pains to put it on the under side of the leaves, as well as on top; but the best remedy is to kill the bugs with your fingers.

John G. Bergen—On Long Island we use dust upon melon vines, and also for turnips and cabbage. The more you can disturb the bugs the better. I once dusted with yellow snuff. I thought that would make the bugs sneeze, and disgust them so that they would leave; but as I found the first dose did not, I renewed it, and succeeded—not in killing the bugs, but the plants.

Adrian Bergen, of Long Island, said that he found dry ashes and lime, mixed and put on the wet plants, an effectual barrier to bugs.

Mr. Carpenter said that he preferred plaster, put on after every shower.

Mr. Nathan C. Ely—In Connecticut we find the plan of using boxes around the hills the cheapest and best remedy for striped bugs ever devised.

Fruit-Tree Insects.

Wm. McM. Lowman, of Darlington, Montgomery county, Ind., writes:

"I have a Duchess d'Angouleme dwarf pear-tree which seems to be troubled with small black ants working at the buds and blossoms, which causes it to appear sickly, and it does not grow. I have dug around it, and applied wood-ashes and soot, but still they are not expelled. Can some of your practical fruit-growers suggest a remedy? The soil is sandy, produces good corn and wheat. A Bartlett pear tree 20 feet distant, is healthy."

Dr. Trimble—The ants do not eat the buds and blossoms. They go up to milk their cows, the bark lice that do destroy the trees. If he can get rid of the lice the ants will not climb the trees.

The Red-Cane Raspberry.

J. A. Donaldson writes from St. Joseph, Berrian county, Michigan, to call the attention of the Club to an excellent kind of raspberry, which he cultivates:

"It evidently belongs to the occidentalis species. The fruit is rather small, when compared with the Antwerp, dark purple, of good quality, but too soft for market. The canes are red, covered with a bloom, and roots at the tips. It is remarkably hardy and productive, and for home consumption is far ahead of the Antwerp, Franconia or Fastolf. It answers the description of the American red-cane of C. Downing and the purple-cane of some other writers. My object in writing this is to inquire why the Club never includes it in their list of raspberries for general culture, as it must be known to its leading members. The Doolittle black-cap promises well here. It is of fine size for a black-cap, and profusely productive. The peach trees are beginning to bloom, and the prospect is good for a large crop. There is probably a thousand acres planted to peach trees within eight miles of this place. The orchards vary in size from three to sixty acres."

John G. Bergen.—The berry described is probably the old red-cane, which used to be extensively grown in this vicinity, but had to give way to better sorts for market. The berry is very good, but not as large nor of such an attractive color as the Antwerp, &c., and its softness is objectionable. It is valuable for a garden on one account—it will not spread like some other sorts.

Insects that Infest Peach Trees.

Attention was called to a green louse that infests peach leaves to a great extent in some localities in this vicinity, causing the leaves to curl; and the question is asked if this is the cause of the disease called peach leaf curl?

Dr. Trimble and Mr. Bergen both stated that this is not the cause—that this is the same insect that has long infested peach trees, snowball and currant bushes, and when very plenty, they do kill the fruit. Dr. Trimble stated it as his opinion that the cause of so many peach orchards failing is trying to grow them on the same ground after the first orchard fails.

Rev. Mr. Weaver said that he had found no difficulty in the soil of Westchester county in growing a succession of peach trees upon the same ground. And as to the curl killing the fruit, I must say that my trees were much affected with the curl last year, yet produced well.

J. H. Arnold, of Salem, Henry county, Iowa, says, to destroy the canker worm that infests apple trees, plow your orchard pretty deep after they have gone down, and be sure and turn over every foot of ground near the trees, and it will settle so that few or none will ever come up again. But if your trees are large and the branches too low to plow under them, then tie old newspapers round the trees; then dissolve rosin in oil until it is quite adhesive, spread this on while warm with a hair brush (a painter's brush is best), early in the spring, and they will crawl on to it and stick fast. Coal oil is said to be best, as it is fatal to almost any insect that touches it. Lard will do pretty well in place of oil for adhesive composition, but it is now too late for this season; therefore you may shake off the worms and catch them as they go up again on it. Another way practiced by some of my neighbors is to bind long straw around the trees, with the lower end hanging loose, in which the eggs will be deposited, and before the eggs hatch out, take off the straw and burn it. Chickens, if you have enough of them, will scratch up and destroy great numbers of them. Thrashing the limbs injures them very much. Tar, oil, paint, or anything that rain will not wash off, is very injurious to the trees.

Dr. Trimble.—The paper of dry seeds, mixed with yellow dust, that was sent here last week for examination, I carried in my pocket, and the warmth proved the dust to be eggs of plant lice, for they hatched, and showed that they are the little pest that has destroyed so many fruit trees, for which a sure remedy is much wanted. Any caustic wash applied to eggs or insects, will kill them. One man steeps leaf tobacco in ley, and mixes soft soap till the mixture is of the consistency of paint, which he puts on with a brush. That must be good, as it will not injure the trees.

Adjourned.

John W. Chambers, *Secretary.*

May 26, 1863.

Dr. John M. Crowell, of New Jersey, in the chair.

California Beer Plant.

John E. Irvine writes from Coshocton, Ohio, inquiring about the California beer plant, which he became acquainted with three years ago at Natchez, Miss., where it was considerably used, and, as he supposes, not known in the North. He says: "If you are acquainted with this plant, please inform me where it can be obtained. If it is new to you, and you desire a more extended and minute description of it, any information that I possess is cheerfully at your service."

Mr. Robinson said this plant is not new to the North. I had it in my house two years ago, using it occasionally for beer, or as a substitute for yeast in making bread. In its manner of growth it is not very unlike the yeast plant, though much larger. A small portion placed in a bottle of water will continue to enlarge until the bottle is filled with a white fungus-like substance. If the liquor is poured off, and a little molasses and ginger added, and that corked in a bottle for a day or two, it is a drinkable, weak sort of beer. I do not think it any acquisition to a family for any purpose.

Corn and Potatoes.

L. A. Williams writes from Yatton a recommendation to plant potatoes and corn in alternate hills. He thinks the potatoes are benefitted by the shade of the corn, and that the land will produce a more valuable crop than when either is planted alone.

APPLES PACKED IN BUCKWHEAT HULLS.

R. F. Bates writes from Brookfield, Vt.

"I noticed a few weeks since, in a discussion on the best manner of preserving apples, a recommendation to use buckwheat hulls. We here in Vermont are getting to use them pretty extensively for that purpose, and find them excellent. I have apples now packed in that way, as fresh as when taken from the trees last October, and of excellent flavor; but let all remember that in both picking and packing they should be handled as carefully as eggs."

SEEDLING APPLES.

Mr. Bates also says:

"Let me suggest another thing. Why may not apples be improved by planting seeds from the best known varieties? I planted a few seeds the last Fall from the best apples I could get, and although I may not live to see them bear fruit, others will."

Dr. Trimble remarked that he saw Porter apples three days since, quite perfect, yet this variety is considered a rather early Autumn apple. He thinks we are beginning to learn how to preserve fruit.

SUITABLE VARIETIES OF GRAPES FOR VERMONT.

David D. Ward writes from Londonderry, Vt.:

"I feel no small degree of interest in perusing your accounts of the Farmer's Club. You are constantly calling public attention to the best varieties of fruit and the methods of cultivating them. Grape culture very justly claims your attention. Although our climate is rather cool and the soil not so well adapted as some to the grape, yet we do not wish to be deprived entirely of this one of nature's choicest blessings. I have a variety on trial, an accurate description of which I have never seen in print, called Early Close Cluster Madeira. It matures near the middle of September, clusters quite large, very compact; berry oblong, about the size of a medium-sized English gooseberry, and shaped like it; color, dark blue; very juicy, flavor very delicious, thin skin, and leaves no unpleasant taste in the mouth; it has no pulpy centre that most varieties have. The past season was the third from the cutting, and although the season was unfavorable, yet they bore quite full and promise all I could expect. I have practiced taking them off from the trellis late in the Fall, prune them close and bury them slightly to keep them away from the mice; there let them remain till after the freezing nights are over in the Spring. Is this the best way, and are there other varieties, think you, that with proper care, will mature in our climate?"

Wm. S. Carpenter—A few years ago a grape was extensively advertised as being hardy in Vermont, and even still north of there in Canada. This afterward proved to be the White Chasselas, a variety that is quite worthless for out-door culture in this vicinity. The kind spoken of by Mr. Ward possibly may be a hardy native, but I should think it doubtful. The kinds I would recommend for cultivation in Vermont, and which I think would stand the Winter there without protection, are Concord, Delaware and Hartford Prolific.

Dr. Trimble—You should add the Adirondack.

Solon Robinson—I certainly would not until it is further proved to be both hardy and valuable for cultivation. It grows, looks and tastes like the Isabella. If it is not that, it is doubtless a seedling of the Isabella.

Silk Worms that Feed upon the Ailanthus.

John D. Wingate, Bellefonte, Center Co., Pa., says the Rev. Dr. G. G. Morris of Baltimore, will distribute this season some thousands of eggs of the silk-worm of the variety heretofore spoken of in this Club as feeding in France upon the leaves of the Ailanthus. He gives an account of the rearing of the worm, as well as of the trees, their food, in the Patent-Office Agricultural Report of 1861.

Protection from Insects.

Mr. Wingate recommends the following as a sure protection. He says:

" Of all offensive things, a real strong smoke-pipe is the worst. Would they not be an excellent protection to put one or two a month to the base of peach trees to keep off borers ? I have for several years used them in my entomological cases, and have found them a sure protection."

The Leaf-Curling Worms.

Dr. Peck, of Brooklyn, inquired how he should cure the curl on pear-trees. It appears to be occasioned by a green worm, with a black head, which rolls up in the leaf. I have medicated them with various substances to no purpose. They are beyond the reach of my physic. What shall I do ?

Dr. Trimble.—The best remedy that I know of for this pest, is to keep wrens in the garden. Set up boxes for them, and they will soon come and occupy them, and a single pair will frequently clear a fruit tree of worms in a few hours. The next best remedy is to pinch the worms' heads.

Dr. Peck—I have tried that, too. I hired a man to perform that disgusting work, but these villainous worms baffle all our efforts. It is almost useless to try to keep birds in our gardens in Brooklyn, the place is so infested with cats.

Solon Robinson.—And pray, Sir, if it was not infested with cats, would it not be worse infested with rats ? You speak of these useful domestic animals just as many others do—as though they were a sort of incumbrance upon the earth. I do not particularly love worms, yet I object to your calling them villainous. They are simply performing the part assigned them in the creation of all things.

Dr. Trimble.—One of the best ways to rid pear trees of worms, is to give them a vigorous growth. This never can be accomplished by those who dig a little hole in the ground, into which they twist the roots of the young tree. These leaf-curlers should teach us useful lessons—lessons of persevering industry. Look at one of them at work—see how it attaches cord after cord to the edges of the leaf, and with what skill and continued effort it draws those edges together, until it finally forms its little house, where it is protected from the weather and hidden from its great enemies, the birds, while it undergoes its transformation.

The Value of Cats on the Farm.

Many farmers do not know one great value of cats. Without them the farmer could scarcely succeed in growing clover. Naturalists have determined that clover blossoms are fertilized by the work of the humble-bee, and the principal reason why the first blossoms do not produce seed, is the scarcity of these insects at that season of the year. Among the greatest enemies of the humble-bee are the meadow mice, and without cats these would naturally increase to such an extent as to destroy the humble-bee, and thus in a great measure prevent the maturing of clover-seed, so that we should be under the constant necessity of going abroad for a new supply. Thus we see how admirably all nature is balanced, and how necessary it is for farmers to distinguish both among insects and animals, which are their friends and which are their enemies. Those who desire to grow clover-seed, should not make war upon cats, nor should they, as many of them do, destroy every nest of humble-bees, which they find in their fields, just as they would the nests of the most noxious vermin.

New Tea Plant.

Mr. R. T. Ostrander, Geneva, Walworth county, Wisconsin, sends us an account of a new tea plant indigenous to Wisconsin, which makes a beverage which he prefers to any but the very best tea. The plant is perennial; when young shows a strange mingling of brown, green and yellow, and looks sickly. At maturity the stalk is sweet and has a pleasant aroma. Over every leaf grows a small yellow flower, which forms a seed ball of about the size of coriander seed. It can be propagated by seed or runners, and bears transplanting from the forest to the garden. The writer says it is found in Kentucky, New York, New Jersey, Ohio, Michigan, and Wisconsin. Plants should be gathered when matured, and dried in a dark room.

Wm. R. Prince.—"This plant, said to be declared genuine by a Chinaman, *The Williamsport Bulletin* states, is found upon wild lands in Clinton Co., Pennsylvania, and several persons skilled in the taste of tea, declare this native sort as good as the imported." The whole statement is utterly erroneous, and must have originated from a person grossly ignorant. The two species, *Thea viridis* and *Bohea*, my father and self have cultivated for more than 70 years, and I am as familiar with these plants as with any other shrub. They, together with the *Rhamnus Theezans*, are evergreen shrubs, natives of the middle district of China, through which the mighty river Yang-tse-Kiang flows, and have never been found in any other country of the globe. These three shrubs constitute the great basis of all the Chinese and Japanese teas, although the Chinese *do* admix the leaves of the *Camellia sasanqua* and of some other shrubs among the commonest class of teas. The only other shrub from which the oriental teas are made is the *Thea Assamica*, grown in Assam and the adjoining portions of British

India, where the English Government have taken much pains to extend its culture; and Assam tea has been for some years an article of regular import and consumption in Britain. Neither of the four species of shrubs above named can be successfully cultivated to the north of Wilmington, N. C. The only species of shrubs or small trees in our country which can be substituted for the Chinese tea shrubs are the *Ilex cassine* and *dahoon*, found growing in abundance in the coast region from North Carolina to Florida. The leaves of these shrubs have been in use by the aborigines of that district from time immemorial, and the Ilex cassine or Yaupon, constitutes the tea in universal use there among the negroes, which has given currency to the common negro adage, "Fried hominy, possum fat, and Yaupon tea is too good." There are several plants called wild tea in different sections of our country, but they have no botanic connection with the genus Thea and the oriental teas. There are but three native shrubs suited to our northern climate that I deem capable of being adopted as substitutes for the oriental teas. These are the Ilex prinoides and Myrica gale and cerifera. The leaves of the Laurus benzoin and sassafras might also be tested as to their merits.

INFLUENCE OF CLIMATE.

R. F. Lighton, Cohasset, Mass., disputes the statements made in the Club a short time since, in relation to the influence of climate. He says: The same remarks are equally applicable to Wheat. While the average yield in Minnesota has been as high as 23 bushels, and never less than 16, and in some particular instances as high as 50 or 60, in Maine the average yield does not exceed 10 or 12 bushels per acre, and that of an inferior quality. The superior excellence of the Minnesota wheat, which weighs about four pounds per bushel more than any other produced in the Eastern or Western States, is undoubtedly due to the limy soil.

Every one that knows anything of the oats and barley of Minnesota and Kansas will readily admit their superior quality, and their average yield is double that of Maine or any New England State (vide Wheelock's Statistical Reports.) The products of California and Kansas might be cited with equal force with those of Minnesota, all conclusively proving that the climate has but little influence on plants within their limits, but the soil a very powerful one. One has only to turn from the fertile prairies of the South and West to the fields of Aroostook, if he wishes to raise pinched wheat, frost-bitten corn, and have his potatoes freeze in the ground, and his apple and plum trees killed by the severity of the Winter. It is this fact that has caused the return of so many who were induced to immigrate to Aroostook.

"All history teaches that climate has but very little influence in promoting or retarding the intellectual growth and vigor, but probably considerable in directing the particular channels in which this development shall seek its expression; but the form of Government, its strength and stability, has a potent and all-powerful influence. I apprehend that the influence of climate on plants is but very little more. Of course there are zones beyond which certain plants will not grow, but their excellence within their proper zone is almost wholly due to the fertility of the soil. That the potatoes of Maine are superior to those of any other New England State, is not due in the least to the climate, but wholly to the peculiar constituents of the soil, in which lime is one of the principal, and to the growth of potatoes an essential element; for the same reason the potatoes of Southern Minnesota are far superior to those of Maine. Also, from the excellency of the soil, the yield of corn in the Western States is far superior to any of the New England States. It is no just criterion to say that in some particular instances there has been a yield of 100 bushels per acre in Maine, while in Ohio the average yield is 50 or 60 bushels—that Maine is better adapted to corn-raising than Ohio. The average yield in Maine will not for any year exceed 30 or 40 bushels, while in Ohio and Minnesota it is more than double."

THE NEWLY DISCOVERED MOUNTAIN OF SALT.

Mr. Nathan C. Ely exhibited to-day a specimen of rock salt from the West Indies, the mountain is eight miles in length, two miles in breadth, and five hundred feet high.

Mr. Solon Robinson said he looked upon it from an agricultural point of view, as a discovery of the very highest importance, having proved that salt, when used upon lands long under cultivation, is one of the most economical substances ever found to restore it to fertility. A specimen of this salt was upon the table; a lump about as large as a ten-gallon keg, which bore the appearance of having been long exposed to the weather, on the apex of a ridge, worn off and glazed over, so as to be impervious to rain. Its whole appearance was that of a great lump of quartz rock, rather dingy, but when broken and pulverized the salt seemed clean, and almost as white as snow.

Mr. Ely.—Captain Hatch while visiting this wonderful salt mountain in St. Domingo, procured and packed on mule-back to the coast enough to fill seven hogsheads, which are now in this city. The lumps were pried out with crowbars, just as farmers would dig stones out of a great pile of rocks. The mountain is covered with earth and vegetation, except in one spot, where a landslide has taken place, by which this great mine of wealth was discovered. Its appearance is more like a great mountain of marble than salt. There are short rainy seasons, and at other times neither rain nor dew. Perhaps one reason why this great deposit of salt has not become known to the civilized world, is partly owing to the ignorant and indolent character of the negro population, and partly to the salubrious nature of the climate, where fresh meat is dried and preserved without salt. As to purity, it surpasses any other rock salt ever discovered, analysis showing 97 per cent. of chloride of sodium. This mountain is situated about 24 miles from the coast, where there is a commodious harbor, but a few days' sail from this city. Arrangements are already making for building a railroad from the mountain to the port and working the mines, and many years will not elapse before the farmers of the United States will be enabled to reap the benefits of this great discovery.

Mr. Wm. S. Carpenter.—Salt is an excellent fertilizer, suitable for any State in the Union. I have seen it used with advantage within several rods of the sea coast. It destroys many insects in the soil.

Tree Cotton.

Mr. Wm. R. Prince.—Considerable notoriety has lately being given to the subject of tree cotton, *gossypium arboreum*. It is a subject of much regret to me whenever I see any laudatory notice that may misdirect the useful and ever willing energies of our citizens, and where their efforts must prove unavailing. Such have been my sensations when perusing the several exciting notices in regard to the introduction and culture of the "tree cotton," urging its capabilities of acclimation, with a statement that certain persons had the seed for sale.

Why, sir, has the time arrived when our brains and judgment can no longer serve to guide us? Can we expect to transpose the climes of the earth, or to change totally the character of the trees of the tropics and inure them to northern climate? I have frequently seen this cotton tree growing wild within the tropical regions, where it attains a height of about 30 feet; but as to its naturalization here, you could with equal success grow sugar-cane, coffee, pine-apple and bananas! Why, sir, you could not acclimate a tropical tree if you had an eternity for the operation.

Of all the animals, man alone is cosmopolitan there being no less than fifty types, each a distinct creation, disseminated throughout all the regions of our globe. It is true that an annual plant such as our ordinary cotton, *Gossypium herbaceum* may, by numerous seminal reproductions, attain to such a degree of acclimation, that it will sustain our summer, yet it will perish with the first frost of autumn. But how think you a tropical tree or plant can ever be hardened to sustain our wintry blasts?

Whoever shall sell one dollar's worth of tree cotton seed, will, in fact, cause the purchaser a loss of ten dollars in a futile experiment. As such erroneous impressions exist in regard to the law of acclimation, I will here elucidate it. No plant or animal can ever be acclimated in the existing race or species by any change of location, as such amelioration attaches solely to their progeny. Seminal reproduction can alone effect such a change, and then only within certain natural limits, and very gradually, through succeeding generations. This harmonious arrangement results from a great natural law, in accordance with which every animal and every tree and plant partakes in a degree of the character of the climate and soil where it is generated. What folly, then, would it be for us to look to the productions of tropical climes for the hopeful parents of a hardy and vigorous progeny, suitable to withstand the rigors of a northern winter? Should we not rather look to the hardy and robust species of trees and plants, which God and nature in their perfective wisdom have spread spontaneously over the temperate zones of our globe? The acclimation of the Persian grape, *Vitis vinifera* (although a native of one of the temperate zones), to its present condition in France, has been a labor of two thousand years; and to render it still more hardy and robust—enough so to sustain our climate (if such a result be possible)—would require another thousand years of continued seminal reproductions, of the same discriminating character as have been so long continued in France.

Such is the character of the gradual climatic associations which have hitherto been, through countless ages, and must forever continue to be, harmoniously operative on our globe.

Dr. Peck asked if there was any remedy to get rid of the caterpillar that is destroying the dwarf pear trees.

Dr. Trimble recommended the care of birds around our gardens.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

June 2, 1863.

Mr. Nathaniel Hawkhurst in the chair.

COTTON AND STRAWBERRIES IN ILLINOIS.

Mr. N. C. Meeker, Dongola, Union county, Illinois, says:

"Please inform the Farmers' Club and the world that 61 bales of cotton left this place a few days ago for Providence, R. I., consigned to the owners, A. & W. Sprague. This cotton was bought under the direction of G. Reynolds, Esq., their agent, and he pronounces the quality equal to good Upland Tennessee, and his judgment is good, for he buys immense quantities of cotton every year. This lot was raised in Union and a few adjoining counties. The Messrs. Sprague, in buying this cotton, offer an inducement to the farmers to plant largely, which they have done, thus changing the farming of the whole country.

"Please inform the Club also that we have been shipping strawberries to northern cities since the 14th inst. Two bushels sent to St. Louis on the 15th brought *forty-four dollars*, or thirty-nine dollars free of all charges. Perhaps this is the most money ever paid for two bushels of fruit grown in the open air in the west. It may seem a big story, but I know it is true, for I have got the money in my pocket."

INSECTS INFESTING TREES.

W. H. Cutler, of Panama, Chautauqua county, N. Y., sends a sample of worms that appear to be likely to destroy apple orchards in that section. "It attacks the young spring shoots, making cocoons of the young, tender leaves, and we want to know the name of this pest and the remedy, if there is any."

Dr. Trimble.—I do not know of any practical remedy for this one of the leaf-curlers which are to be found all over the country, and will continue to increase so long as man makes war upon his best friends, the birds.

H. W. Howe, of Akron, Ohio, says the trees are infested there just as described by Miss Bliss, of Liberty, Wis., in her letter read May 12. He says that the injury to the trees is trifling. "The insect that thus writes a part of its history upon the smooth bark of the apple trees is of a light green color, about one-third of an inch in length, with a flat triangular face, upon the upper part of which are two prominences, from which it has derived its name—the Buffalo tree-hopper, *Ceresa bubalus* of Fabricius. The eggs are easily discoverable by the naked eye, and are frequently to be found in double rows, the ends of the rows nearest to the puncture converging. The rows are about one-sixteenth of an inch long, and there are from six to eight eggs in a row.

"I might write you more fully, but for the probability that your State entomologist, Asa Fitch, has already, as he proposed doing, described the punctures, the insect, and a parasitic fly whose larva feeds upon the eggs of the 'tree-hopper,' specimens of all of which I forwarded to him in the season of 1858."

The Rev. W. C. French, of Oberlin, Ohio, writes as follows:

"One morning last fall, after a heavy blow in the night preceding, I found my finest raspbery canes broken off in the middle. At first I supposed it was the effect of the wind, but upon examination I find them all perforated as if stung by locusts. I inclose specimens. Will I be likely to lose them again this year, and is there any remedy?"

Dr. Trimble.—From the appearance of the specimens, I judge it is the same insect so well described in Mr. Howe's letter. We do not know any remedy, and there is no certainty that because the insect was there last year it will be there again this year.

Here is a more serious pest, which appears to be rapidly extending. If there are any present who have not examined the asparagus beetle and the manner it attaches its eggs to the stalk, here are some samples. The beetle is a pretty tri-colored one, and its eggs are dark colored and attached singly by the ends to the branches.

Mr. Solon Robinson read the following extract from *The London Medical Times*, as pertinent to this question:

BIRDS AS DESTROYERS OF INSECTS.

"A distinguished naturalist, M. Florent Prevost, conceived the idea that it would be a matter of great interest to collect, at different periods of the year, the stomach of every description of bird he was enabled to procure, to examine and preserve its contents. This collection, commenced 35 years since, has now reached a considerable size. The stomach, opened and dried, together with their contents, are fixed on card-board, upon which are inscribed, beside the name of the species of the bird, the indication of the locality and the date of its death, together with the names of the animals or plants which have been recognized as forming part of the contents of the stomach. It results from these researches that birds are in general far more useful than hurtful to the agriculturist, and that the mischief done at certain periods by the granivorous species, is largely compensated by the consumption of insects they effect at other periods."

A conversation then followed upon the usefulness of birds to farmers in this country, particularly crows and quails.

Mr. Wm. S. Carpenter said that since birds have been allowed to increase in that part of Westchester county, where my farm lies, I am satisfied insects have decreased, and fruit increased.

THE MEASURING WORM—HOW LONG HAS IT BEEN HERE?

John G. Bergen inquired if any one knew the date of the appearance of the measuring worm in this city and Brooklyn.

Solon Robinson replied that it was only about five years since its depredations became so great as to attract attention to any extent, and now it is everywhere a great destroyer.

Dr. Trimble.—I cannot tell the date of its appearance, but I recollect that soon after the morus multicaulis mulberry excitement this worm was noticed, and some people thought it must have been introduced into the country with those trees.

Mr. Hawkshurst said that he remembered seeing these worms here twenty-one years ago.

John G. Bergen.—I am sure that I saw them in Brooklyn twenty-eight years ago, and I remember a circumstance that proves that they were upon the Battery, in this city, as early as that.

Dr. Trimble.—These worms are now a terrible pest in this city. The trees in Union square are eaten almost bare of leaves, and the worms hang in myriads by their little threads, ready to drop upon the ground, or upon the heads of passengers. Ladies avoid the Park, because they cannot go near it without bringing away some of these undesirable appendages to their dress. I noticed one of the street lamps almost covered with the worms. The keeper of the square said that a few years ago there was a large number of cedar birds visited the trees and nearly destroyed all the worms..

Mr. Wm. S. Carpenter.—I am under the impression that all birds feed on worms.

Sorgo Cultivation.

Henry Daniels, Bedford, Pike county, Ill., says that a great majority of the people of that county are as dependent upon the sorgo crop for all their sweetening as the new settlers of timbered countries are upon the maple trees. In most cases the molasses made on the farm is a very poor article, not on account of the source from which it is derived, but from the mode of manufacture, and he wonders if there is any book published that will give farmers the much-needed information.

Solon Robinson.—There is a book published in this city, and obtainable from booksellers everywhere, upon sorgo culture, which embraces Lovering's experiments in the manufacture of syrup and refined sugar from sorgo juice. There have been several other publications upon the mode of manufacture, but where for sale, and at what price, or whether suited to the wants of farmers in that part of Illinois, I cannot say. Perhaps the publishers do not wish me to say, nor to sell their books; if they did, they would probably advertise their value to those who need such information.

Prof. Mapes.—I have no doubt with proper skill, sugar can be made from sorgo, just as easily as syrup. Mr Lovering's experiments prove this, and also prove that much depends upon the time of cutting the cane, and that it must not be cut long before it is ground, unless some agent is used to counteract the acidity of the juice. One of the most important facts for manufacturers of sugar from this new product of the farm to learn, is to boil the juice rapidly. If boiled slowly in open kettles, it will never make good sugar. Cutting the cane before it is ripe—cutting it too long before grinding and boiling—not correcting the acidity—boiling slow, are reasons why much of the product is, what this man calls it, poor stuff.

The form of the kettle is important to those who wish to make sugar. It should not be round-bottomed, nor should the fire be allowed to come up on the sides of the kettle, because the syrup burns and forms caramel, and that prevents granulation, and colors the syrup, and gives it an acrid taste. Vacuum pans are too expensive and too difficult for farmers to manage, so they must use open pans, which should be made shallow and flat-bottomed, and set on brick work, so as to be easily lifted off with a crane. What is known as the "Perkin's process" could be conveniently used upon the farm. A frame covered with wire gauze is made to fit into the pan, and is floated on the surface of the boiling juice, and the portion that rises to the surface, which is usually skimmed off, passes through the gauze as it rises, and forms on the upper surface, and is then lifted by the crane all at once, and does not disturb the liquid as the skimmer does, which if not very carefully used, is apt to injure the granulating process. No one should attempt to make sugar without the use of a thermometer. When the syrup acquires such a density that it only boils at 240 deg., it may be put in sugar molds to slowly cool and granulate, and will not only make good sugar, but far better syrup than by continuing the boiling.

It is almost useless for any farmer to undertake to make sorgo sugar until he has learned how from books or seeing others do the work. There are plenty of books upon sugar-making and refining, the general principles of which would suit the sorgo cane as well as the Southern cane sugar-making.

DO PEACH TREES NEED PROTECTION IN IOWA?

Mr. Carpenter stated that a resident in Clarke county, Iowa, told him that peaches could not be grown there without winter protection for the trees, and this was accomplished by cutting the roots upon one side and turning the trees down and covering them with earth. To do this much easier, he had adopted the plan of setting the young trees so as to form roots only upon one side. Trim off all one side when set, and place boards or flat stones under that side, to prevent roots from growing into the ground. In autumn the tree is easily bent over toward the rooted side, and any small roots that have formed are cut away from the other side.

Solon Robinson—It sounds very strange to me to hear the assertion that peach trees need winter protection in the south part of Iowa, when I know they do not need it in the north part of Indiana and Illinois, and I must have more than one witness to make me believe that all this labor in protecting peach trees is necessary anywhere in Iowa, except in the northern counties, and doubt whether it is there.

YELLOWS IN PEACH TREES.

Mr. John G. Bergen.—I have investigated the subject of Yellows in Peach trees, but without getting any light on the subject.

Dr. Tremble.—I do not think we have found the cause of the Yellows. I have no doubt it is caused by an insect, but I have not discovered them.

KANSAS WILD FLOWER SEEDS.

Solon Robinson.—I have something from the Kansas women for their sisters who attend this Club—something to make them glad that they do attend. Here is a lot of flower-seeds from the wilds of the West. And here is a sprig of one of the most delicious odorous plants that I know of, the *Galium odoratum,* a remarkably interesting plant which, the lady says, I never saw anywhere but in Kansas on the banks of the creek. These seeds are sent with the following letter from C. W. Craig, of Black Jack, Kansas:

"Please accept these few Kansas flower seeds, as a little thank-offering for your kind notice of my letter last summer. I have not all the varieties I mentioned, but hope to procure others during the coming summer and fall. Perhaps you are acquainted with the red bud. I have no doubt it would be hardy in that climate. It is beautiful at the time the lilac is in bloom.

"Perhaps the seeds need swelling in hot water. The Pentstemon is very fine—flowers about the size of the Canterbury bell—the leaves very rich.

"I think all the plants a great acquisition to a garden, and hope you will be pleased with them. The tuberous larkspur grows in moist places, but will flourish anywhere. It has a scape-like stem, and is a beautiful plant. I have a very few seeds of a perennial Phlox, resembling the drummondii in color. The ruella resembles the petunia, and is a very interesting plant—blooms in the morning—perennial. I wish the Club could spare more time on flowers.

"I have not time to write any thing for the press, or I should like again to ask them to pay more attention to floriculture.

"I love to read their discussions on raising fruit, and should be equally interested in reading occasionally the experience of members in the cultivation and improvement of flowers.

"You give us vegetables for our repast, fruit for our dessert, and please give us a dish of flowers now and then for spices.

"I have just thought of Mr. Fuller's proposition to the Vermont lady, which I read two or three weeks ago; and will, if you please, mention what would, I think, be a great favor to the lovers of flowers in Kansas.

"I think if the Club should send an agent with choice trees and shrubs, or if some good gardener should commence the business in Lawrence, or some other favorable locality, there would be a great demand. Gardeners, if I mistake not, keep very few varieties of choice shrubs or plants of any kind.

"I have tried to get different sorts of roses, also, althea frutex, and rose acacia, and others that I had at the east, but have not succeeded. I have sent to friends and to two seed stores in New York, for seeds of the althea frutex and rose acacia, but cannot get them. May I beg the favor of a few seeds if you have them?"

Mr. Robinson said that he hoped gardeners or nurserymen, who wish to change or make a new location, will think of what is said in this letter about the opening in Kansas.

Mr. Carpenter said that he had no doubt every one present felt as he did, highly gratified with this letter and its contents, and hoped that the writer in the closing request will be kindly remembered. The *althea frutex* mentioned is not the most desirable variety, the flowers being single, while other varieties are double and much more beautiful.

HAWTHORN FOR STOCKS FOR BUDDING.

J. B. P. Day, Kennebec, Iowa, writes: "Will you, through your Farmers' Club report, tell many of us in the west whether or not the common hawthorn, that bears a red, edible fruit, sometimes very good, is the kind Mr. Prince recommends as stock for pears?"

Mr. Bergen replied that, in the absence of Mr. Prince, he could not say positively, but thought it was not.

Mr. Carpenter deprecated the use of any kind of thorn for stocks for pears.

EFFECT OF ROOTS STRIKING FROM PEARS ON QUINCE.

John G. Bergen.—This spring, I had occasion to move twenty-five pear trees on quince, which I set five years ago, at two years old, budded low on the stock, so that it was easy to set them two to four inches below the junction. Upon about one-third of these trees, I found that there were plenty of quince roots, but none from the pear. About one-third had both pear and quince roots, and in some instances, when the pear roots were vigorous, the quince roots, though still in place, were dead or dying. Upon the other third, there were no quince roots left, the whole tree being sustained by the new roots formed from the pear. In one case, the tree was budded upon pear, and that had straight roots, reaching downward. On the trees where new pear roots had formed above the quince, they all appeared disposed to spread out horizontally. The trees still retaining quince roots are not as large as the others, and those with both pear and quince roots prove that the latter do not always die as soon as pear roots form.

Mr. Wm. S. Carpenter.—I do not think Mr. Bergen has stated all the facts. I think if he had stayed a few years longer he would find that the quince roots would have all disappeared and their place supplied with roots from the pear.

THE PROSPECT OF FRUIT.

This question was considerably discussed. Dr. Trimble thought the prospect bad for all fruit, except black Tartarian cherries, about Newark, N. J. Mr. Quinn, superintendent of Prof. Mape's farm, three miles west of Newark, said the prospect was good for all varieties of cherries. Mr. Hawkshurst thought the prospect generally good for apples in New Jersey. Mr. Carpenter said it was good in Westchester county. Dr. Trimble said that peaches may be better this year than last, as the curl leaf is much less prevalent. As to any particular insect causing the curl, I have not been able to detect it by careful microscopic examination.

PRESERVING POTATOES IN SUMMER.

William Pettingill, New Lisbon, Otsego county, writes: "Please to ask the members of the Farmers' Institute Club, what is the best method of preserving potatoes for summer use?"

John G. Bergen.—Keep them in a cool, dark cellar. If sufficiently cool, it matters not about its being damp. If stored in bulk, handle often, to check tendency to sprout. If in barrels, empty from one to another occasionally, and that will break off many sprouts.

Wm. S. Carpenter.—If taken from the cellar to a dry room, and allowed to wilt a little, it checks the sprouts, and the potatoes may be then returned to the cellar. Some persons sun their potatoes now and then in summer; some sprinkle them with powdered lime, which absorbs the moisture.

Prof. Nash.—If potatoes were stored in a room just above the freezing point, they would keep an indefinite length of time. Potatoes are always soundest and best that remain in the ground over winter, and in store they keep best in a condition that approximates nearest to the natural one.

If a pit was dug on some northern slope and the potatoes placed therein, cover lightly with litter, in the winter pack ice over, and towards the spring cover with straw, I think potatoes could be kept over one year.

The Flax Crop.

Richard Gaines writes from Fairfield, requesting "attention of the Farmers' Club to the fact of a large amount of flax fiber in this county, the last year's crop being yet on hand, add to which this year's also, which will make a large amount. I had 30 acres last year, and this year have 65 acres. I think there could be 300 tons of flax straw obtained in this county alone, if some man would come out here and bring a machine for breaking the fiber, and go round through the country the same as a thrashing machine. He could get employment for a long time. Why could not the Fibrilia Company send out men and machinery to this State and put our fiber to a good use?"

Coal Tar for Apple-Tree Borers.

M. J. Pond writes from Concord, Morgan county, Illinois, an account of his success in keeping away apple-tree borers by the use of gas tar. He first cut out all the worms that he could find, and then about the middle of June applied the tar with a brush, just above the ground, which was packed hard, and also covered with tar in a little strip around the tree. He says:

"It is well to apply the brush to the forks of the tree, as the borer sometimes does great damage in those parts of trees. I would not be understood that coal tar will destroy the borer when once deposited in a tree, but if once entirely eradicated, I will insure that it will not make its appearance again in the region of the tar, if applied yearly at the proper time. I have applied the coal tar to my orchard for five years in succession, and have never had a tree injured by it, but, on the contrary, I would never wish trees to grow thriftier and bear fairer fruit. My trees are from five to fifteen years old. The use of coal tar on my apple trees is no longer an experiment, and I have also tried it on peach and pear trees with the same good results."

Adjourned. John W. Chambers, *Secretary.*

June 9, 1863.

Mr. Martin E. Thompson in the chair.

NORTHERN SPY APPLE.

The secretary laid on the table some specimens of the Northern Spy grown by Mr. Thos. Frothingham, Rochester, N. Y.

Mr. Wm. S. Carpenter.—The specimens of fruit on the table are very fine specimens, showing the keeping qualities of this apple. I would not recommend it for general cultivation, although in certain localities it is an abundant bearer. Mr. Hicks, of North Hempstead, L. I., has discarded it.

The Chairman.—I must give my testimony in favor of the Northern Spy on my daughter's farm, at Glen Cove, it was the only apple last year that came up to the standard.

DOES THE QUALITY OF SEEDLING POTATOES IMPROVE?

Nelson Case, of Granville, Ohio, asks this important question. It is one which many others would like answered. To many it may be well known that it requires several years for a seedling potato to fully develop its character. Mr. Case says: "I have some seedling potatoes which look well and yield well, but when cooked are heavy. Will they probably improve, and in what length of time?"

Wm. S. Carpenter, who has had as much experience as any member of the Club, answered: They will improve, if in the start they appear worthy of further trial. It sometimes takes years to bring a seedling potato to perfection, and sometimes, after years of trial, it is found that the new seedling is not worth propagating, and it is thrown away. It requires a great deal of patience and perseverance to obtain any real improvement in potatoes. Probably not one in a thousand of all the seedling potatoes ever grown has stood the test of cultivation and been approved by the public.

INSECTS INFESTING POTATOES IN IOWA.

James Vincent writes from Tabor, Fremont county, Iowa, that he is interested and instructed every week by the reports of proceedings of this Club, and is as tired as the reporter is of the repetition of the nonsense of letter writers about the cause of potato rot. Some of these causes remind him of the opinion of a man as to the cause of the gradual submersion of a tract known as Sandwich Flats. He replied "that he was an old man, and he thought he ought to know, for he had known the flats when they were far enough above water, and that was before Tenterdon steeple was built, and it was his opinion that the building of that was the cause of the sinking of the flats. If it was not that, then what was it?"

This, says Mr. Vincent, is just as sensible as many of the potato theories. I have no theory; I only know that potatoes have declined in quality for twenty-five years, and that the same old-fashioned potato bug that was found upon the vines long before and ever since that, does not, in my opinion, cause disease. Of late the old potato bug, which is three-fourths of an inch long, black, with a yellow stripe, has given place to another (samples of which I send you), which is very destructive to the leaves, stripping them entirely. In autumn they go in the ground, and as soon as potatoes grow in spring the bugs come up and attack them. They commenced laying the eggs I send you about May 10. There is also a slug from a fly that eats potatoes more voraciously than the bugs.

If any member of the Club knows anything about these creatures and what will deliver us from their depredations, we would like to know. I know nothing but hunting them daily, and several times a day, and destroying them and their eggs.

In respect to their influence upon the rot, I do not believe that they have any influence either way, though my potatoes were last year almost free from rot, the bugs being kept down, while others were badly affected where the bugs had free course.

INSECTS ON GOOSEBERRY BUSHES.

Mr. Vincent also says: "I have sent you some eggs of an insect or fly which I fear is about to injure our gooseberry bushes Two weeks ago I discovered that my bushes were covered with little yellow spots, which, on examination, proved to be eggs, on the underside of the leaf, and on many of the berries. I had seen no insect or fly, though I had paid great attention to the bushes. I picked them all off, also, from some wild bushes in my garden, which took a great deal of time. Can you tell anything about them? and what is necessary to prevent injury from them? This day I have seen some flies about the wild bushes, two of which I send you, though I am not much of the opinion that they lay the eggs. I wish I had some standard work on entomology; which do you think is a good one to have? I would like to inquire what standard work there is on the *Philosophy of Draining*, where it is to be bought, and the probable cost?"

Dr. Trimble.—I will take these things and examine them, and see if any of the eggs will hatch. Some of them have on the way here. These fine eggs upon gooseberry leaves are often taken for rust, or mold. The best work on entomology is that of Kirby & Spence, but there is a small work by Professor Jager, that should be better known. Most of the scientific works are too full of learned terms to suit ordinary people.

Solon Robinson.—The work on draining that our correspondent wants, is that of Judge French, of New Hampshire. It is for sale in most bookstores at a dollar.

THE MELON BUG.

Mr. Carpenter inquired if others had noticed that the striped melon bug was not at work this spring? He said it appears to have left our part of the country (25 miles northeast of New York).

Solon Robinson.—I have not seen or heard of a melon vine being destroyed where I live this spring. I prepared to put boxes around the hills to keep off the bugs, but have had no occasion to use them.

DO BUGS BITE PLANTS.

Ald. Ely put this question for the consideration of those who are disposed to observe, because he had lately read in a work approved by Prof. Agassiz that they suck and perforate leaves but do not bite them—that they have no power to bite.

INSECTS—WHAT ARE THEY?

Dr. Trimble, in answer to this question, said spiders and worms are not insects—wasps and bees are, and they are the type. Insects are in sections with six legs, with sometimes two and sometimes four wings, and with antennæ that guide them in all their movements. The bee makes the most accurate measurement in the world with its antennæ, never erring or varying the fraction of a hair in form or size of the cells.

THE LOCUST (CICADA).

Norton Case writes from Granville, Ohio, May 30: "The seventeen year locusts are up for the fourth time in this place since my residence here. They have had their holes open to the surface for some days, and began to crawl up the warm side of my house the evening of the 25th inst. The next morning they were out of their shells, but unable to fly."

Alfred Churchill, of Kaneville, Illinois, says:

"I would by no manner of means assert that your Club are not all 'Solons,' but on the locust question I would venture to intimate that close observation would show them that, if the said locust does not eat, it has a powerful faculty of suction. By inspection it will be found to have always a bill to present to all succulent shoots of trees, of the then present year's growth, which it persistently advances till satisfaction is obtained. Its sucker and incisor, or rather incisors, are formed like those of the Illinois green-head fly, and he uses it in the same way, for be it known to your honorable Club, that the *life* of all blood-sucking flies is the sap of plants, and blood their *death*, except the stable fly, which has an entirely different apparatus for suction. Musquitoes take the sap of grasses, herbs, flowers, &c. Gnats I always found more abundant about nettles and currant brush. More observation is needed than a hard working farmer can give. This I have abundantly proved by close observation in Illinois, Missouri and Minnesota; in Illinois on the flies, musquitoes and locusts; in Missouri on the fly and locust; and in Minnesota on the fly and musquito."

Dr. Trimble.—I am well convinced that locusts suck the sap of plants while under ground. That they do that, I have proved by careful experiments. Miss Morris, of Germantown, Pa., who devoted much attention to the study of the locust, dug up pear trees and found the insects attached to the roots. I have hatched the eggs in earthen flower-pots, in which I buried the roots of such plants as the locusts live upon, and afterward found them, when so small that I had to use a glass to see them, with their sucker inserted in the bark. Of course, where there are millions of them, they must injure the trees.

ABOUT WETTING GRAFTS IN THE MOUTH.

Norton Case, of Granville, Ohio, says: "I have a fine lot of grafts now growing, that I set myself, and not having water handy to wet them I did it with my mouth. Perhaps the man who says wetting grafts in the mouth will kill them, chews tobacco. In that case, I should think it would."

PEAR-TREES BLIGHTED—WHAT IS THE CAUSE?

J. S. Woodard writes from Hess Road, Niagara county, New York, June 1, as follows:

"We have had a rather cool day—'thermometer 56°' in shade—and a very strong southwest wind, with two small showers; one with a little thunder and lightning.

"Being in my pear-orchard, I have noticed what I never saw before. This morning my trees were all growing very thriftily—to-night, the Belle Lucrative, Virgalieu, Bloodgood, and a variety which I obtained in Ohio—a sort of double bearer—have all of them many young leaves, and some of the young shoots, black, wilted, and dead. The other varieties which I have, Bartlett, Swan's Orange, Osband, Summer Tyson, Lawrence, are all right. Let me trouble you and the Farmers' Club to tell us what has caused the mischief; is it the wind, or blight? One tree of the Ohio variety stands by the corner of a corn-house, so that half or more is protected, and on the protected side it is all right, and on the exposed side it is full as much affected as any other, and the southwest side of all the trees is very much worse than the other. My soil is dry gravelly ridge, three miles from the lake shore, and I never had a pear-tree blight unless these prove so. All kinds of fruit promises an abundant yield, and all crops look well."

Dr. Trimble thought he had seen trees that had been growing very rapidly affected in a similar way, by a cold storm, and soon recover from the effect.

Solon Robinson.—Yes; but this does not appear to be a cold storm, as the temperature is given at 56°, nor was the wind from a cold quarter, nor are the trees affected generally supposed to be tender. The effect is a phenomenon not easily accounted for. It does not appear to be the ordinary "pear blight," for that comes in a different manner, attacking one branch after another, by a slower process.

Mr. Wm. S. Carpenter.—Blight does not affect trees of a slow growth, but trees that grow very rapid are very subject to it. Trees that produce wood very late in the season and do not ripen, in the spring the sap becomes chilled or frozen, as it is called, and the trees probably die.

A NEW FIBROUS PLANT.

Mr. Solon Robinson read the following interesting extract from a Boston paper:

"The Hon. Wm. Pryor, President of the Historical Society of Halifax, has discovered a new fiber for textile fabrics, which has been fibrilized by S. M. Allen, of No. 3 Tremont row, of this city, who pronounces it a good substitute for flax or hemp. It resembles sweet clover more than any other plant of the kind. Mr. Pryor describes the plant as follows: The Melilotus, planted in drills, twelve inches apart, in May, comes above ground in twelve or fifteen days, grows luxuriantly, yielding an enormous crop from one planting for several years. This plant may be cropped at the stage of growth when it is is found to yield a fiber most suitable for the fabric or purpose required. It grows to the height of from four to six feet. For paper stock, the Melilotus may be cut, dried like hay, and converted into pulp, immediately from the field—the fiber and wood, or stalk, being together available for the different varieties of paper. A peculiarity

—and a valuable one—of this plant is, that it may remain in the fields all winter, the air, the snow, frost and rain rotting it effectually, without injury to the fiber. In the flower garden, the Melilotus is already well known and appreciated for its delicate flower and agreeable and lasting perfume.

A CHEAP COOKING VESSEL FOR STOCK, OR HEATING WATER.

Mr. J. S. Woodard, Hess Road, Niagara county, New York, gives the following directions for making a useful farm implement:

"We have in this vicinity a cooking apparatus for cooking hog feed, which is very cheap and simple, and is worth a score of stove kettles ; it may be new to some. To make one, get a sheet of No. 18 iron—32, 34, or 36 inches wide, and about 7 feet long ; take 2-inch pine planks about two feet wide, and make a box a little flaring at the top, and wide and long enough so that the bottom sheet will cover, and project half an inch on each side and end ; let the ends into, the sides $\frac{1}{4}$ or $\frac{3}{8}$-inch in making the box, and put it together in white lead and oil, and put three or four $\frac{3}{8}$-inch iron rods through the sides, across the ends outside of the ends, and then nail on the bottom sheet with two rows of fivepenny nails, the nails about one inch apart in the rows and breaking joints, and bend up the sheet where it projects, and your box is finished and will hold 25 or 30 bushels ; now take some flat stones or bricks, and make a small fireplace eight inches narrower than your box is wide on the outside, and put across at each end a piece of iron, so as to have a row of bricks across under the end of your box, and at one end let the arch run out, so as to build a small chimney, or put on a couple of joints of stove pipe, and you have a cooking or scalding apparatus that will beat the world—try it and see."

PRESERVING FRUIT IN ICEHOUSES.

Mr. John W. Keeny, Franklin, Lenawee county, Michigan, inquires about the value of a plan for keeping fruit, which has been sold in that State to individuals at $10 each. "It is to lay up ice in a wall around the sides of the icehouse, leaving a space in the centre, to be filled with boxes or barrels of fruit, packed in snow, where the seller of the 'patent right' says it will keep an indefinite length of time."

Mr. Wm. S. Carpenter.—I do not think that this plan will answer. If the ice or snow melts, it will spoil the fruit. I have tried some experiments in this way, but did not succeed as well as I have in the way I have mentioned several times that I preserved my fruit last year. Fruit has been preserved in a perfectly dry, tight room, surrounded with ice. In 1861, pears, melons, berries, etc., were put up in Ohio, and in June, '62, were found perfectly sound. The process is a secret.

Solon Robinson.—We have had upon exhibition, before this Club, perfectly sweet fresh mutton brought from Algeria.

CORN BREAD, CORN MEAL, AND HOW TO PRESERVE CORN.

Mrs. Jane Mason writes from Medina, Ohio, the following testimony in favor of a more general use of corn bread:

"After several years' experience, I know there is nothing eaten nearly so nutritious as corn meal, if properly cooked. I have noticed, after being without meal for several weeks, that when we get a little fresh, and the breakfast table is supplied with a dish of hot cakes, instead of coming in to dinner hungry, at or a little before noon, my husband would work until one or two o'clock, unless called sooner, and then, if summoned to dinner, he will say, 'Why, it can't be noon yet; I am not at all hungry.' Now, hot corn cakes are in easy reach of every farmer's family in America. I think they are best made with fresh buttermilk, and that is fresh (according to the weather), until it takes an undue proportion of soda to correct the acid. You truly say, corn meal needs a great deal of cooking, and therein consists the inconvenience, for firewood is becoming of consequence; but a little forecast will obviate much of that difficulty; for what with washing day, ironing day, baking day, and dinner to cook every day, an abundant supply of corn bread might be baked with little or no extra fire. And let me tell you what to do with the bits that are left. Make them into a bread pudding; and corn cakes or pan cakes are equally good, made just as you would make a common bread pudding, only season to suit the taste. I prefer ginger. The dry corn bread soaks so thoroughly and uniformly that there is a danger of getting the batter too thick; but a very little practice will enable you to get it right, and you will be surprised at its superiority over wheat bread puddings. It ought to be the most common dish on the farmer's dinner table; being baked twice, it has that thoroughly cooked taste which is so essential. Now, I will stake my reputation on the assertion (as people say who have a public reputation which they prize), if cold corn cakes were muddled up in China or Brazil, and rechristened and sold by the pound, no 'respectable family' could do without pudding made of them. The matter of domestic economy, as a virtue, has no hold on the moral perceptions of the great majority of the American people. Indeed, they are rather ashamed to be thought saving; therefore nothing cheap, notwithstanding its utility, becomes popular. I want to see a little more conscience in this matter. Why should not the housewife feel just as badly, if she has been needlessly wasteful, as if she had committed any other wrong?"

Prof. Nash approved its sentiments highly, and he thought the hit at the American people about economy a very just one, because it is true that many people are afraid of being called penurious if they practice economy. There is no doubt, he said, of the fact that our soldiers who come from districts where corn enters largely into the food consumed are the strongest, hardiest men. Consumers of corn naturally make good warriors, for it makes strong arms, and consequently brave men; and, as a matter of economy and hygiene, it should enter more largely into the food of the masses of the people. At the taverns of the south and west he had always found corn cooked in various ways, and he wished the same custom prevailed all over the country, so that it might become fashionable. He would not recommend families to use corn exclusively, but give every one a chance to choose corn bread if preferred to wheat.

Mr. N. C. Ely.—I must take exceptions to the remarks of the Professor, I do not think corn should be eat regularly in families, it is heating to the blood and makes the body feel logy. Nearly all the corn that comes to this market is destroyed by being heated, and is not fit for food. As to its making good soldiers, history gives credit to France for producing the best soldiers, and their food is not Indian corn. In North Carolina the people live upon hog and hominy, but that does not make better soldiers than New England produces. There is one greater objection to the use of corn as food in cities than the expense of fire in cooking, and that is the unsound condition of the corn, which is very liable to heat and grow musty when stored in bulk. It is so much so that steam machinery has been invented to manipulate and restore musty corn. The contrivance is only partially successful. The only safe way to transport corn is in the ear, and if we had an inland ship-canal that could be done, and he thought we ought to advocate such a canal.

Solon Robinson said that the reason the Irish disliked corn bread was, because the corn or meal sent from this country was spoiled on the voyage. He thought there should be a law to compel owners of all corn, that is to be transported in bulk, to first kiln-dry it, since it often spoils so as to be very unhealthy for man or beast. He once lost a horse by feeding him upon corn that became musty on the voyage down the Mississippi to Vicksburg, and he has no doubt that musty corn is often the cause of sickness, when little suspected; but he believes that there is no healthier diet than corn, when used perfectly sound, if sufficiently cooked. He also commended very highly the use of hominy, and coarse corn meal, and the use of a hand-mill, so as to have it fresh ground upon every farm.

Mr. Wm. S. Carpenter.—My opinion has not been changed by the remarks made to-day. I consider corn makes an excellent food for the human family.

Lima Beans and Lima Squash.

A quantity of Lima beans and Lima squash seed imported by Mr. John Groshon from Lima, presented by Mr. Isaac Buchanan, was distributed among the members present.

Adjourned.

John W. Chambers, *Secretary.*

June, 16, 1863.

Mr. Martin E. Thompson in the chair.

The Hay Tedder.

David Lyman, of Middlefield, Conn., highly commends a hay tedder, manufactured by Stephen Heald, Barre, Mass., at $75 each. These machines are mounted upon a pair of wheels, with shafts like a cart, and as the horse moves forward, the hay is thrown up by forks attached to cranks. Mr. Lyman says:

"Imagine a cloud of hay 8 or 9 feet wide, extending from the ground to from 6 to 8 feet high, behind this machine, and you have a good idea of the mode of operation. A boy 12 or 14 years old can operate it."

Prof. Nash.—I have no doubt about the operation of the machine, that it will do all that the gentleman says, and that it is a well made machine, for Yankees are in the way of making such things well, and I have no doubt about its being a very useful farm implement, in such a climate as

England, where it takes from five to fifteen days to cure hay in the field. There, such a machine is very important. Is it so here? It is very doubtful, or rather, it is not doubtful in my opinion. If grass is mainly cured in the swath, windrow and cock, it makes better hay than when fully exposed to the hot sun. If too much exposed, the juice is all evaporated and the woody fiber of the stalk is turned to substance not much more nutritious than wood.

Solon Robinson.—I fully agree with Mr. Nash in his opinion of the utility of a tedding machine. People of New England derived their ideas about haymaking from England, and have pursued the same course, stirring the hay continually in the sun, so as to get it dry enough to put in store the same day it was cut. In my opinion, if left in the swath to wilt and only partially dry, and then cocked and cured, it will be more nutritious. I have seen hay cured in this way, that sweated in the cock and turned quite dark, yet was sweet and was eaten greedily. This method of making hay involves the necessity of hay covers, but they would not cost as much as a hay tedder.

Fifteen Seedling Strawberries.

Geo. H. Hite, of Morrisania, exhibited fifteen sorts of seedling strawberries, the first year's fruit of plants taken from the original. These were referred to a committee consisting of Messrs. John G. Bergen, Wm. S. Carpenter and the Rev. Mr. Weaver for careful examination. They reported as follows:

No. 1. Berry large, sweet, flat cone shaped, dark scarlet color, flesh pink—desirable variety.

No. 2. Very large, high flavor, scarlet color, flesh light color—berry rather soft for market.

No. 3. Large, color dark scarlet, flesh light, very prolific, excellent flavor—the favorite of the committee.

No. 4. Berry long, pyramid shape, some more than an inch in length, color dark, flesh pink, flavor fair.

The above may all be classed as decidedly large varieties.

No. 5. Irregular shape, dark scarlet color, dark flesh, flavor rather tart.

No. 6. Berry short but more regular than No. 5—rather less tart than No. 5, but in other respects somewhat similar.

No. 7. Berry quite dark colored, not large, but the best flavored in the collection.

No. 8. Berry small at the neck, size medium, crimson color, flavor very good, apparently very prolific.

No. 9. Berry very dark, flesh dark, size medium, flavor not remarkable.

No. 10. Color light red, size medium, flavor fair.

No. 11, 12, 13, 14. Berries all dark, medium size, rather tart flavor, with dark flesh—No. 13 being the lightest color of the four, but in other respects similar.

No. 15. Good size, light scarlet color, flesh quite light, flavor rather inferior.

The Committee thought it very unusual to find fifteen seedlings with so few faults, and recommend Mr. Hite to continue the trial another year or two, with several of the best, as the first crop is never sufficient to decide the character of any seedling. Some that have appeared promising at first have afterward proved quite unworthy of cultivation.

Mr. Hite said that he had already thrown away a vast number of seedlings, but hoped by perseverance to get an improvement, and recommends others to pursue the same course.

Mr. Carpenter spoke of the success of a new strawberry plantation of ten acres, near Mamaroneck, Westchester county, which, from present indications, the proprietor thinks will yield 75,000 quarts. The plants are set eight to twelve inches apart, in rows three feet wide, which are cultivated by horses, and to obviate the effect of the present drouth, which has almost ruined the strawberry crop in many places, this field is watered daily by a sprinkling cart. The largest portion of the field is set with Wilson's seedlings, which appear to be in good favor with all who grow strawberries for market in that vicinity.

Mr. Hite thought Downer's about as prolific as Wilson's in his neighborhood, and more saleable, because a much handsomer color, being a bright scarlet.

FLAX MACHINES.

Mr. M. B. Wright, of Forest Lake, says: "We are putting up a flax mill this summer, and I do not know but some of the Club know of some other than Sanford & Mallory's machine. Please bring up the matter for discussion and elicit information."

Prof. Mapes.—Mr. Geo. W. Billings has a machine for breaking and cleaning flax. He takes the flax from the field, and by mascerating it first in warm water, is able to complete it fit for the spinner in a very short time. On suggestion of Mr. Robinson, it was resolved that the subject ef Fibres be made the special subject of the day two weeks hence.

DEERS' HORNS—WHAT BECOMES OF THEM?

Dr. Trimble, in speaking of the Philadelphia Parks, mentioned the very ornamental feature of the herd of deer, and that their horns were just now in the velvet.

Prof. Mapes.—Can you or any one alse tell me for a certainty, what becomes of the horns shed by deer, which are seldom, if ever found in the woods? An elk or moose sheds off nearly 100 weight of horns, almost an entire mass of phosphate of lime. Is it possible that the necessary amount for the new growth in a few weeks can be obtained from the ordinary food of the animal, or does it bury its old horns, where they soften so that it can return and eat them at the proper time? Who knows aught of this great secret in nature?

ARE SQUASHES MONŒCIOUS?

E. Wilbur, of Albion, writes:

"Will you please present to the next meeting of the Farmers' Club of the American Institute the following inquiry relative to the squash, the pumpkin, and other monœcious plants: Do the squash, the pumpkin, &c., properly belong to the monœcious family, with which they are generally classed? Linnæus, and I believe all his successors, describe the pumpkin as having the male and the female organs in different flowers on the same plant. In conversation lately with a very observing and intelligent English farmer and gardner, he stated that, from a long series of observations made by his father and himself, and also by other large gardeners, that a different conclusion had been arrived at; that the sex was not in the flower, but in the plant; that the male plant produced all male flowers, and the female plant all female flowers. And not only that, but also that the sexual character extended even to the pumpkin; that each pumpkin was either exclusively male or exclusively female, and the sex of each could be easily determined by the shape of the blaze or scar at the blossom end. Acting upon this theory, he had selected his seed pumpkins with a careful regard to their sexual character, taking but a small portion of seeds from the male pumpkin to mix with a much larger proportion of seeds from the female, for planting in his fields; the result of which is that he has much larger and better crops of pumpkins than his neighbors. If this theory is correct it is one of importance, as the planting of the seeds of but one sex in a field or garden will make the fructification dependent upon accidental foreign supplies of seminal opposites by the chance agencies of the winds, or of bees, or small birds."

Mr. Carpenter said that an acquaintance upon Staten Island is a full believer in this theory of sexes in the squash family, but he had been unable to discover its truth; but he had discovered that the soil of one farm will produce a good crop of pumpkins, while that of an adjoining farm will not. He gets corn, pumpkins and turnips from the same plat, each a good crop.

Mr. John G. Bergen.—I grow from 5,000 to 10,000 squashes a year, for the city market, and I have not yet learned that there are any barren vines. I believe the theory advanced a humbug.

Another member said he was told about this theory by a Scotch farmer, and he tried the seed from pumpkins of what were pointed out as male and female, and both produced fruit; but he must say that the vines from the seed of the female sort were the most prolific.

We advise farmers to make experiments in this matter, until they prove whether this family of plants are or are not monœcius.

Disease of Raspberry Bushes.

J. De Witt writes from Nunda, Livingston county, New York:

"To ask information on one or two points of interest to me, and some others. I have black raspberry bushes which have formerly borne very nice fruit, but gradually from year to year one bush after another in the row grows sickly, and ceases bearing in part, or wholly, and instead of sending up three or four strong shoots as a healthy bush will, there are sometimes a dozen or more, which look very tender, the leaves are smaller and lighter colored, and about the last of May there comes on them a sort of mold, which gradually becomes a bright orange color, like the specimens inclosed. If some one, through the *Tribune*, can give me the cause and cure I shall be much obliged."

The Black Knots.

Dr. Peter L. Hoyt, of Wentworth, N. H., discusses this question as follows :

"Is the 'black wart' on plum trees caused by the curculio? These excrescences are very common in this locality on certain varieties of plum trees grafted on the Canadian plum stock; more especially are the Lombard and Duane purple thus diseased. I have watched them very closely in their germination and growth, and when in the gum and soft state, have seen the curculio in the act of perforating and depositing its eggs on the surface. I have also followed the subsequent growth of the larvæ to maturity, and am quite certain with the doctor, that this insect is in no way connected with the production or growth of this fungus. It simply uses it, in common with the fruit of the tree, as a repository for its eggs. Now a word or two in regard to the treatment of the plum wart—with me it has been excision, in its true surgical sense, either by cutting off the entire limb, or cutting out the entire fungus growth in its incipient stages. This latter operation may be made successful for a time at least, if care be taken to extend the incision sufficiently wide and deep enough to include the whole of the disease. I think it absolutely necessary to cut to the heart or pith of the branch. I do not pretend to decide the question whether the disease starts from the centre or surface of the limbs; but one thing is certain, no superficial cutting in any stage of its growth will assist it only for a short time. And as cancer in the human system, notwithstanding the temporary check it may receive from the surgeon's knife, is likely, in the end, to cause the death of the subject, so this disease is pretty sure to impede the growth and thrift of the tree, and ultimately destroy it. Please excuse the liberty I have taken in addressing you, but being a constant reader of the discussions in the Farmers' Institute Club—are excuses which I trust you will consider."

Mr. Hite remarked that he had frequently practiced this surgical operation for the black-knot, and had always found the limb marked with a dark colored line under the excrescence; and the incision must be deep enough to remove all this line, or there will be no cure. Sometimes this line extends below the pith, and then the limb is almost certain to die if the line is all cut out. In such cases the whole limb may as well be cut away.

Dr. Trimble.—I will not affirm that the curculio does not cause this excrescence, because there is a mystery about the matter in this respect. There is not a particle of doubt that an insect so exactly like the curculio that the difference cannot be distinguished deposits its eggs in these excrescences, for I have seen them at work, and have cut off the limbs and hatched out the eggs, and produced something exactly like curculios; yet I have never been able to get these insects from the knots to work upon the fruit when offered to them. Again, when I had a plum orchard that I used to protect from curculio by the only means that I ever found effectual—that is, jarring them down upon sheets—I had no black-knot, although there was an orchard near by that was so destroyed by the disease that it was finally all cut down; and then my trees were attacked, and as fast as the excrescences made their appearance in June, I cut them all off and reduced them to ashes, and thus got rid of the disease.

Locusts and other Insects.

Mr. J. H. Arnold, near Salem, Henry Co., Iowa, writes: "A few words to the American Institute Farmers' Club. First, about locusts. In a late report Dr. Trimble says, they eat nothing above ground. And in the notices of locusts in the newspapers generally, so far as I have observed, the idea of their eating nothing seems to be admitted. Now, as this is locust year in a large district in the Ohio Valley, the fact that they do eat is easily ascertained by view. They settle on the body and large limbs of apple trees, and probably most all other trees, and penetrate the bark with their bills, or proboscis, and become so intently engaged that you may put your finger on them; at one view hundreds may be seen with their heads down tight on the bark and their bills inserted. Now about the loup-worm, (called canker worm in this vicinity), the greatest orchard pest in S. E. Iowa. They hatch out in this latitude about 1st of May, and continue about a month, and then descend to the earth, where they lay dormant till next spring. To exterminate them, plow them under, and very few will ever get out. If you cannot plow your orchard, the next best I know of is, when the frost is coming out of the ground in spring, to tie paper around the trees and brush on it an adhesive mixture of oil and rosin. This will catch the female mot (that cannot fly), as it ascends the tree. Some will, however, crawl over and get up. Many other means are practiced, but it requires much attention and perseverance to exterminate them in any other way than by plowing. The apple tree borer, I think, is the progeny of a brown bug about three-fourths of an inch in length (commonly called snapping bug, because if laid on its back it will right itself by a peculiar snap). They appear about 1st of June, and will secrete themselves under any wrapper near the root of the tree, and may be killed. The locust borer is the progeny of a green bug, spotted with black, about an inch in length. They appear in September, and we know of no way to exterminate them. Whitewash is only a slight mitigation. They entirely destroy our locust groves, intended for fence posts. An easy and effectual remedy for this would be worth thousand of dollars to Iowa. I am a practical farmer, and like most others are trying the willow humbug."

Prof. Mapes.—It may not injure trees to put an adhesive mixture upon paper around them, but any substance of that kind, whitewash included, applied to the bark is injurious. On the contrary, the caustic soda-wash is beneficial, not only to kill all insects that harbor in the bark, but to make the bark smooth. Perhaps it would benefit the locust trees as well as fruit trees.

Dr. Trimble.—The closest observers are convinced that locusts do not eat anything after they emerge from their long confinement in the earth. I wish the writer of this letter would send us some millers of the loup-worm of Iowa, and let us see whether they are the same as those which have become such a pest in this city and Brooklyn, and which I find are indentical with those in Philadelphia. I found there that poultry was used to some extent to destroy the worms, and it suggested the idea of putting a large number of fowls in Union Square, and then shaking down the worms every day. A very large portion could be thus destroyed. I found the starling very busy upon the trees in Philadelphia. There are many small birds, but they cannot manage the worms after they are full grown. There are squirrels also in Philadelphia parks, and they eat some worms; they also eat young birds. These worms have become such a pest in these cities that every suggestion for their destruction is worthy of consideration. Much might be accomplished by hiring persons to destroy the eggs upon the trees.

Mr. John G. Bergen.—It has been proposed to hire children to collect the worms, and doubtless much might be accomplished in that way. I got rid of the cockroaches in my house by perseverance in killing all that could be found.

Dr. Trimble.—That Iowa letter writer is entirely in error about the snapping bug being the progenitor of the apple tree borer. I am not acquainted with the locust borer, nor a remedy, but I do know that the apple borers are doing immense damage, and must be picked out by hand when they once make a lodgment.

Propagating Quinces.

Will some one tell me the best method for propagating the Japan quince? I have tried cuttings in the spring, and failed.

Potatoes.

After all that has been said on the subject of potatoes, and your patience so exhausted already, if I knew anything to prevent their commencing to rot, I should not dare to tell it, but I believe the injury may be very much lessened by proper care after they do commence rotting. If ripe, or nearly so, dig them immediately, without waiting to get ready, and do it on a dry day if possible. Let them dry on the ground through the day, then spread them on the barn floor if not dry, or if they are dry, they can be put up together, sprinkling lime all through the pile. If it is too light, cover a little hay or something over them. I leave mine in the barn till I am afraid of their freezing, then put them in the cellar, and I have scarcely any rot after they are dug."

Disease in Raspberry Vines.

Mr. Wm. S. Carpenter.—The best way to prevent the disease in raspberry bushes is to remove the plants from the old plantation to a new once every three years, taking care always to keep them in rich ground, well manured.

Mr. John G. Bergen said, as a general thing, that view is correct, though I know one plantation upon Long Island upon sandy soil which is still vigorous and fruitful upon the same ground it has occupied for 20 years, but the ground has been very highly manured every year. As a general thing, old raspberry roots produce many barren canes, and such plants are more apt to be affected by this disease than others having a very vigorous growth. Speaking of manuring raspberry plants reminds me of the theory which has been advanced, and very generally adopted, that a strawberry field required no manure. I fell in with that theory.

Mr. Solon Robinson.—So did I, and fell overboard.

Mr. John G. Bergen.—So will every one, figuratively speaking, who attempts to grow strawberries or raspberries without manure. They both require high manuring, with strong putrescent substances.

Prof. Mapes.—I doubt that. I have my raspberry plantation in the same place it has occupied for 15 years. I know the theory is that all plants of this family require a large amount of nitrogenous manures, but mine have never been dressed with a pound of anything but superphosphate of lime at the rate of 200 pounds to the acre, and my plants are entirely healthy, and the yield of fruit satisfactory.

Mr. Wm. S. Carpenter said, in answer to the inquiry about quince cuttings, that those of the Japan variety are no more difficult to propagate than any other, and of any kind he does not lose 5 per cent. They are taken from the bush in autumn, after frost has killed the leaves; the cuttings about 12 inches in length, the lower end cut just below a joint, and planted at once in rich, moist earth in a shady place. He succeeds with rose cuttings treated in the same way.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

June 23, 1863.

Mr. John P. Veeder, Guilderland, N. Y., in the chair.

BOYDEN'S NEW STRAWBERRY.

Dr. Trimble.—Since the last meeting I have seen a new strawberry growing in Newark, N. J., the gentleman who raised it is a scientific man. The strawberry was not the result of accident as most of our strawberries are, fifteen of them weighed a pound.

I ask that a committee be appointed to investigate the merits of this new candidate for favor with strawberry culturists—a new seedling, which it is acknowledged excels in size, or rather, in the number of large berries produced, all others ; 28 will fill a dinner plate, weighing an ounce each. The Doctor and Mr. Carpenter both spoke of it as "the best of all strawberries." Solon Robinson conceded excellence to it, but contended that it was not better than twenty other sorts, and not at all equal to the Hooker.

Dr. Trimble.—Last week I had an opportunity of testing some very fine strawberries, they were grown on the grounds of Mr. W. R. Prince, at Flushing, L. I., some of the varieties were the finest I ever tasted.

PROFITABLE STRAWBERRY CULTURE.

A letter from Mr. Riker, of Stamford, Conn., inviting the Club to visit his place to see the growth of strawberries, incidentally stated that he is sending them every morning to New York, where he gets 50 cents a quart, and this is equivalent to $1,000 an acre—the variety, the Austin seedling, which he prefers over Wilson or Triomphe de Gand. Mr. N. C. Ely, Dr. Trimble and Mr. S. Robinson, were appointed the committee.

A NEW DAIRY IMPLEMENT

was exhibited by Mr. M. A. Richardson, of Sherman, Chautauqua county, N. Y., and submitted to a committee, for trial and report. It is a patented contrivance for straining cream, through a No. 60 wire gauze, which frees it of all white specks, which cannot be converted into butter by churning. and which injures the butter, as it cannot be worked, nor washed out, Straining cream has long been practiced by the tedious process of squeezing it through a cloth, as it not only frees it from these deleterious particles, but rendering it more homogeneous, it is churned easier and makes more butter. It also, occasionally, takes out a fly, bug, hair, or other unnecessary addition to the cream pot. This implement is a large tin pail, with a pump plunger in a tube at the bottom, by which the cream is rapidly forced through the strainer, right into the churn. It looks worthy of notice from butter makers.

On motion a committee of three were appointed to examine, test and report on the merits of this invention.

Mr. Solon Robinson, Mr. John G. Bergen, Mr. Wm. S. Carpenter, and Mr. John P. Veeder were appointed the committee.

DEATH OF MR. EDWARD DOUGHTY.

Dr. Trimble.—I rise, Mr. Chairman, to perform a melancholy duty, yesterday I attended the funeral of our late lamented associate, Mr. Edward Doughty, who died at his residence, at Newark, on Saturday last, at the ripe age of 75 years.

Mr. Doughty was a constant attendant at the meetings of this Club, and took a deep interest in its deliberations; respected and loved by all, and he loved all that tended to the improvement of agriculture and horticulture. At the time of his death he was a member of the committee on agriculture of the American Institute.

On motion of Mr. Robinson it was

Resolved, That the Secretary incorporate the remarks of Mr. Trimble in the proceedings of this meeting.

ANTS.

Sarah R. Ferris writes from Iona, Michigan, recommending whitewash to keep aphides from trees, and tar around the body to keep off ants; or, if tar is not convenient, use soft grafting-wax. For ants in houses, the same remedy placed across their path.

YEAST CAKES.

Scald Indian corn meal with boiling water, cool to blood-heat, and add half a tea cup full of light yeast to each pint of meal. When very light add meal till you have a stiff dough. Form a roll two inches through, and cut into cakes half inch thick, and dry in the shade upon plates or smooth boards. One cake will raise two loaves if set in a sponge. Potatoes are highly recommended to be boiled, mashed fine, and added to the sponge.

ADVICE TO THE CLUB.

Mrs. Ferris also writes, as follows:

"I am very much interested in the progress of the 'Farmers' Club" but wish and pray they may not recommend the cultivation of any article for the destruction of the human family. Tobacco is certainly a useless article, and is vitiating the mind and body of a great portion of our males, young and old, and some portions of our females. There is enough in this world that is nutritious and useful for agriculturists to produce that will be a blessing instead of a curse. Grape culture, for the purposes of wine-making is also recommended. Wine never is beneficial in any case. 'Tis merely a stimulant, not a tonic—and millions have been and are being destroyed by it. The first record we have of the use of wine is, that Noah drank of it till drunken, and then cursed his son. Grapes are excellent and nutritious, and every family ought to have them for their healing properties, in cases of fevers, and especially bowel complaints. A nice syrup can be made of grapes, and kept without fermentation, which is very soothing in cases of debility."

Dr. Trimble.—This lady tells us how to drive away ants from the trees, but she don't tell us what harm they do. Can any one tell whether they do any?

Mr. R. G. Pardee.—Yes: I have had strawberries nearly destroyed by them, and I have always found the best thing to treat them with is hot water. Find their nests, and scald them and cook their eggs.

Mr. Wm. S. Carpenter.—I use no other remedy. It can be poured hot enough to cook the ants, without injury to any but very tender plants.

Mrs. Elizabeth Bush, of Busti, N. Y., recommends spirits of camphor upon the nests or haunts of ants, but she is in doubt whether they do not do more good than harm in the garden, since she finds them destroying other insects. For instance, she says:

"I had a box of pansy seedlings a few weeks old, that the little green bugs were killing, though I had smoked them with tobacco, and tried other means to destroy the bugs, not the pansies. I set them out on the ground, and this morning I did not see any bugs, but the little ants were running over the box. You that are learned in such mysteries, tell us, do they do any harm?"

That is an important question for all cultivators to consider—Are ants noxious animals or not? We must learn to distinguish enemies from friends.

Mrs. Bush also says: "I desire to express the interest I take in the discussions of the Farmers' Club. I wish, too, to second the motion of C. W. Craig, of Kansas, that you talk more about flowers. Please to mention for her benefit that I got althea seeds of B. K. Bliss, Springfield, Mass."

Tomatoes and Melon Bugs.

A lady gives the following remedy for the striped melon bugs. She says:

"Some six or seven years ago, a gentleman who is something of a gardener, told me he had observed that vines growing near tomatoes were never touched by the striped bug. In a very quiet way, and by several years trial, he had satisfied himself that the striped bug had a peculiar aversion to the odor of the tomato-plant. Since that time I have tried it repeatedly, have had excellent cucumbers, and never a bug. Perhaps it will not be too late for some of the Club to give it a trial this year. An occasional plant among the vines, with plenty of good hoeing, and frequent watering if the season be dry, would probably be better than to have so many as to shade the vines. Perhaps it may interest some of your readers to know something of the prospect of the growing crops in this part of the West. The season has been an unusually fine one, and the winter wheat was never better. Spring wheat and oats are equally good, and there is a greater number of acres sown than ever before. We hear the same from every part of the State. Wisconsin can supply England, if need be, and fill her granaries to the brim. There is also considerable hay."

Rev. Joshua Weaver.—I think that my breed of melon bugs must be different from others. I saw it recommended to keep coops with hens and chickens in the garden. I tried that, but they did not rid my vines of the bugs. I have grown tomatoes and melon and cucumber vines together, but that did not prevent the depredations of the bugs.

THE PENNSYLVANIA TEA PLANT.

Hulda Barton, of Pittsfield, Penn., sent a specimen of the Tea Plant that has been spoken of so much of late in the papers. She says: "We have made it and put it before good judges of tea, and no one knew but what it cost $1.50 a pound. The leaf resembles that of the tea we buy."

Solon Robinson.—I have tried this tea, and find a slight resemblance to the real article. Undoubtedly, as one correspondent said, it has been used by store-keepers to mix with tea, as I think an adulteration of ten, or, perhaps, twenty-five per cent. would not be detected. It is different from the Yupon tea, used in North Carolina, and does not produce so stimulating an effect as that. It is also more pleasant to the taste.

A NEW PLANT.—WHAT IS IT?

A. G. Chapman, writes from Scipio, New York, (near Cayuga lake):

"I inclose a few specimens of a new plant sent to me. I have lived in this vicinity for the last 23 years and have not seen it before. What is it? Although deeply interested in other departments of the *Tribune*, with me your reports of the Institute Club are a kind of dessert which I should sadly miss, if they should be omitted. While writing I will mention our agricultural prospects. Winter wheat: a very large breadth sown; three-fourths of it looks very promising; more than an average crop may be looked for. Early sowed wheat, barley and oats are looking well; late sowed feels the drouth. Hay will be fully an average crop. Pasture good; the cows show it in a good flow of richest milk, other stock in their sleek and thriving condition. Corn small but promising; a good crop expected. The wool crop will be larger than heretofore.

Mr. R. G. Pardee.—The plant is a *Tekalia*; one of the tassel flower family, grown as an ornamental garden plant.

BARREN CURRANTS.

A. N. Ward, Freedom, N. H., wants to know "if currant bushes, grown from cuttings will produce fruit. My father has some over fifteen years old, that have never produced a full grown currant. They blossom every year and currants form, but they always blight and fall off before they are half grown. If they will grow from cuttings, I should like to know why these do not mature."

To this inquiry Mr. Carpenter and Mr. Pardee replied that the cause of the currants not maturing has nothing to do with the fact that the bushes were propagated from cuttings, since that is the way that nearly all such fruits are propagated. The fault is, perhaps, owing to the method of cultivation, which should be in rich, mellow ground, and not as is usually the case, in the most out-of-the-way spot about the premises, where the bushes are allowed to run wild.

Mr. Veeder said that he finds it a good way to set currant bushes through his orchard.

Solon Robinson.—I set mine in rows in line with the orchard trees, so as not to interfere with plowing one way.

Botanical Works.

J. Nelson, Franklin, N. Y., asks the Club "to name the best works upon botany for new beginners—something of more practical utility than Linnæus's or Wood's botany."

John G. Bergen.—I object to the Club giving an authoritative opinion of the merit of any particular work. Besides, I do not think it is our business to advertise things for any bookseller. Let him take a hint and attend to his own interest.

Oil an Antidote for Worms on Trees.

E. Parker, of Lebanon, Luzerne county, Pa., says: "Oil is a specific to drive worms from fruit trees. Every case where I have used it, the worms have left the trees—though I do not believe in specifics and certain cures, and in sixty years' medical practice, have never used or prescribed a quack patent medicine. I believe that patent quack medicines and tobacco are injuring more people and destroying more lives than the war. I use Summer strained lamp oil, applied with a rag around the body of each tree, just below the limbs, and around the limbs that the nests or webs were on. In three days every worm left the trees and never returned. Afterward I applied oil to fruit trees with like success. In every instance where I have used oil it has driven off the worms."

Mr. Carpenter don't believe that the oil has any effect upon the worms.

Mr. Veeder thinks if it was of very strong odor it might drive off the worms—not otherwise.

Remedy for Roaches or Croton Bugs.

Dr. Crowell.—The parings of cucumbers, placed where the bugs can eat of them, are the most effectual remedy for these pests that I have ever found.

Remedy for Rats.

And the best remedy for rats is to fry pieces of cork in fat and place them in the way of rats, which swallow them, and find them so indigestible that they become disgusted and leave the premises.

Plowing Under Green Crops.

An Iowa farmer writes from Davenport as follows:

"Nothing interests me more than the reports of the Farmers' Club. Some talk on early plowing in green crops for manure attracted my attention, and I wonder it was not earlier thought of. We in the West, cannot raise good crops on late plowing, more especially of new prairie. I have replowed late plowing in the spring, and found the weeds and grasses nearly as sound as when covered in the fall. In our soil such a mass of unrotted straw under ground is an injury—worse in a dry than a wet season. No good farmers think of plowing late here.

PEACH TREES NEED PROTECTION IN IOWA.

"I also notice you want proof that peach trees need protection in this latitude. I have been trying to cultivate some for eight years, and they have been frozen to the ground five winters out of the eight. Last winter being unusually warm, we have this year (for the first time in the last nine,) some peaches, but where they are exposed on the open prairie there are but few, and in many places none. I do not like the idea of turning the tree down to protect it; it seems to me that it would keep the tree stunted, and finally kill it. Some have been protected here by keeping the tree trimmed low, and covering it in the winter with straw, which is kept from the tree by setting long brush up over the tree first. By covering thick and keeping the straw on late, some have succeeded in raising a little fruit. What protection would the club advise?"

With such an accumulation of testimony the Club must be satisfied that peach trees do need protection in Iowa, and recommend growing them almost flat upon the ground. A young tree can be trained into almost any shape, and to grow horizontal limbs not more than a foot from the ground.

The Lampas in Colts.

Solon Robinson read a short letter from Wadham's Mills, N. Y., which elicited a long, animated debate. The writer asked for information about burning the lampas in colts mouths. "Is it a whim or a necessity?"

Mr. Wm. S. Carpenter.—In my opinion it is a necessity. It certainly is no whim that colts are affected with this disease, and they cannot eat while so affected, and I know of no other way to get rid of them so easily as by burning. If cut, they bleed, and the cure is not so effectual. I had a colt ten years ago, troubled with the lampas, and used all the mild remedies that I knew, before resorting to the hot iron. Then I had no trouble in effecting a permanent cure. I find the hot iron an excellent remedy for other diseases. I have several times applied it for quarter crack.

Mr. Weayer said: I have had some experience with horses, and never heard this remedy for lampas, called in question as cruel and unnecessary.

Dr. Crowell.—If the iron is heated to a white heat, and applied skillfully, it gives very little pain. An iron barely red hot is painful, and not so effectual. If the colt has the disease very lightly, it may be cured by astringents and light remedies. Some veterinary surgeons use a seaton in the mouth. I do not approve the practice. It is more painful and dangerous than burning. When a colt is slightly affected it is a good plan to feed him ears of corn to bite upon.

Mr. R. H. Williams.—Is there such a disease specific and peculiar to the horse? or is the disease usually called lampas only an inflammatory local disease incident to all animals that shed and renew their teeth? I regard the disease in the latter light, and although generally incident to the period of dentition, both in the human and the brute creation, yet not necessarily so, as many children and colts pass that period with but little or no inconvenience; the gums being normally capable of severe pressure without pain. At the time of shedding, of course, the gums are above the points of the teeth (their usual protection), and are exposed to irritation and consequent inflammation. The common remedy is astringents such as borax, alum and tannin in solution applied to the gums, counter irritant, as hard corn fed in the ear in some cases. But a better and always successful treatment with me is an active liquid stimulant, either camphorated alcohol, or olive oil and spirits of ammonia combined in about equal parts. This last is the surest and most speedy, although at times rather severe. The period of dentition in the horse is from two to five years old, each year shedding and cutting teeth in different portions of the mouth. During the process, of course, the gums are found overlaying the points of new teeth in some part of the mouth, and very subject to inflammation of the parts from the irritation of dentition or cutting, as it is called, possibly to the hindrance of mastication, and sometimes checking the growth of the horse; but in the hands of a skillful attendant, who understands the cause and gives the proper and timely attention, the difficulty seldom becomes serious, and always disappears after the horse attains his full mouth at five years old. It is true that aged or adult horses are often afflicted with ulcerated or inflamed gums that troubles them, and at times may seriously impede mastication. But an examination will usually reveal some local cause, such as tartar around the base of the teeth, irritating and inflaming the gums. Wolf teeth, as they are called, is another cause of irritation, at times affecting the eyes. The remedy in each case is the removal of the excrescence, and the irritation ceases, the gums heal and the horse thrives again. If the lampas is a specific disease it should have those peculiar characteristics that mark that class of diseases, viz: a periodic run, and common to only one race, and seldom attacking more than once in lifetime the same individual. In no such disease is removal of the parts required by amputation or burning, that I am aware of, or are they ever resorted to, except by empirics or novices. The fireing of the hoof, alluded to by Mr. Carpenter, for split hoof or quarter crack is not a parallel and has no connection whatever with lampas or inflamed gums in the application of remedy. The object in the case of cracked hoof by a cross cut at the junction of the sensible and insensible hoof just at the edge of the hair, and that seared with a hot iron is to arrest the connection between the old cracked hoof and the new process of growth, that the new hoof may be perfect when grown, being disconnected by the cut and prevented from uniting again by the burning, thus freed from the working of the old crack during the process of new growth—the true remedy in this case—but having no application to the other. The foregoing views, I think, will be found to be sustained in the main by all of the best modern authorities, viz: Youatt, Spooner, Dadd and Mayhewe and others. And nearly all of them characterize the burning and cutting out process as "totally uncalled for and barbarous practice." It was with a view to prevent the endorsement, without dissent, however feeble, by this association, of the cutting and searing system.

I avail myself of the indulgence of the Club to enter this, my protest, against the further promulgation and practice of this barbarous, useless and unscientific practice, upon so valuable and beautiful a gift of the Creator to man as that of the horse, and second only in utility to the cow.

Dr. Trimble.—I fully agree with this gentleman.

Solon Robinson.—And I do not. He is talking of a disease that has no more to do with the lampas than bleeding at the nose has. Lampas is not merely an inflammation of the gums. It is a constitutional disease that sometimes attacks aged horses, and I do not believe that there is any remedy that is so effectual and causes so little pain as burning with a hot iron. I do not ask the Club to recommend this practice—I do it on my own responsibility. There are cases of sores upon the human system that won't heal, which if cauterized with a hot iron will at once commence the healing process.

Mr. William Matthews, Greenfield, L. I., exhibited some fine specimens of cherries, and desires to be informed if they were the Black Eagle. The cherries were tested and a difference of opinion was expressed, some called them the Black Tartarian, others the Black Eagle.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

June 30, 1863.

Mr. Adrian Bergen, of Long Island, in the chair.

GRAFTING WAX.

Nathan Shotwell, Elba, Genesee county, N. Y., says he has grafted extensively for twenty years, and so have his brothers, as their father did before them, and their rule for making wax is, for early use five to six parts of rosin, one part of beeswax, and one part of tallow. When the weather gets warmer, increase the proportion of rosin to seven parts. Melt, pour in water, and grease the hands and work the mass thoroughly. No farmer should allow trees bearing poor fruit to shade his soil when so little trouble is necessary to convert the most miserable, worthless fruit into the most delicious the country affords by grafting, which any one can easily learn to do, when he knows how to make good wax, which he must put on so as to shut out air and water from the whole cut surface where the scion is inserted.

HOW TO GROW QUINCES.

Edwin Reynolds, of Metomen, Fond du Lac county, Wis., says quince bushes grow so fast there that they are sappy and winter kill; hence no fruit, and wants to know what to do.

Dr. Crowell, who has given much attention to fruit growing upon his farm in New Jersey, said the best remedy would be summer pruning; that is, pinching off the terminal buds of all the most rapid growing branches, which would make what remained more hardy.

PLASTER AND SALT AS A REMEDY FOR THE POTATO ROT.

Thomas Carpenter, Battle Creek, Michigan, I find the application of a mixture composed of one part salt and two parts plaster, a remedy for the potato rot, apply a large spoonful to the hill just as the blossom buds set.

HOW TO GROW SHORT-LEGGED CABBAGE.

Mr. Carpenter also recommends that the holes should be made about eight inches deep from the surface of the ground, three feet apart, set the plant at the bottom of the hole, and as it grows keep filling up the hole gradually with rich earth; when done growing the head will rest on the ground."

Mr. Wm. S. Carpenter.—I could not recommend this plan without considerable experience, as it appears to be one that would not answer upon a flat, wet soil, in a rainy season.

Solon Robinson asked the Chairman (an old Long Island farmer), what would be the benefit of growing short-legged cabbage. He replied that in light soils the plants sometimes get top-heavy and fall over, so as to injure the heads. To obviate this the great cabbage farms grow a kind that is naturally short-legged. This is better than growing the long-legged in the way recommended.

BEANS AND BUGS.

Dr. J. Weston, of Baraboo, Wisconsin, says melon bugs may be kept off by planting a circle of beans around the hill, to grow till the melon or cucumber vines are too large for bugs, and then to be pulled up.

GRAFTING WILD CHERRY.

J. H. Garretson, of Richland, Keokuk county, Iowa, wants to know if the early May cherry will grow grafted upon the wild cherry, *prunus Virginiana.*

Several members replied to this inquiry, expressing an opinion that the wild cherry will not answer for stocks for grafting cultivated cherries upon.

CORN IN MINNESOTA.

Jesse H. Soule, of Stillwater, Minnesota, says that he has lived in Minnesota eight years, and he is sure that Indian corn does not average more than 30 bushels per acre. The highest yield given in his township was 50 bushels, and that upon guess work, while many other crops were rated below thirty. He deprecates such extravagant estimates as that lately given to the Club by Mr. R. F. Leighton, of Cohassett, Mass.

PEACH TREES—DO THEY NEED PROTECTION IN IOWA?

S. Foster, Muscatine, Iowa, says:

"Twenty-seven years in Iowa enables me to speak upon this subject, and experience enables me to give facts to correct an error in your theory of burying the peach tree in the soil. You err in tracing parallels of latitude across this broad continent to determine the same climate. Iowa is inland from any large body of water, which is a great modifier of climate, cooling the extreme heat of summer, and modifying the extreme cold of winter. Our spring and fall seasons are warmer than in the same latitude east, but our mid-winter is colder. Last winter our thermometer fell 16 degrees below zero, which killed many of the peach buds. I think the killing point of cold for the fruit bud of the peach is between 10 and 20 degrees below zero, varying according to the condition of the tree. Experience: My latitude is 41 degrees 26 minutes. The fruit bud has been killed about two years out of three. I tried burying the small tree in the soil, and all the limbs and stalk of the tree killed in the hard frozen earth. Two of my neighbors tried the same experiment, with the same result. But to bend down, and cover with boards, rails, or brush will save them."

R. T. Ostrander, of Geneva, Walworth county, Wis., expresses the same opinion about peach trees winter killing in Iowa; that it is owing to its remoteness from large bodies of water, and instances the fact that peaches fail in the southern tier of counties in New York, and succeed further north, near the lakes. In Iowa fogs are not so prevalent, and winds are drier than near the lakes. Further west, other trees gradually fail, until none but the cotton-wood thrives.

The Peach Leaf Curl Disease

Mr. O. also says: "A word on curled peach leaves, which your Club do not appear to understand. The leaves froze just as the bud was opening. Leaves from the new buds, after the 25th of June, will be fair as usual. Pear spurs that freeze in the same way die to the heart of the branch, and sometimes kill the branch."

Mr. John G. Bergen.—This man is certainly mistaken in his theory about the peach leaf curl. If it is caused by cold weather, why is it that it was unknown thirty years ago? I do not think that I have noticed it further back than twenty years, and I certainly have been familiar with peach trees much longer than that. We have much more evidence that the disease is caused by insects than by cold weather.

Mr. Wm. S. Carpenter.—I am quite positive that I have had the curl upon my peach trees when it was impossible to attribute it to cold. And as to peach buds killing by very cold weather, that depends upon the aspect of the ground; for upon a hill side facing north I have grown peaches after the trees had borne 24 degrees below zero.

Strawberries—Immense Production.

John C. Snyder, of Tallmadge, Summit Co., Ohio, writes as follows:

"I have been much gratified in reading the discussions of the American Institute Farmers' Club. It may be interesting to know how large a quantity of strawberries can be produced by proper culture on a small piece of ground. From a bed 40 by 47 feet, I raised, last season, (1862) 586 quarts, or 18 bushels 10 quarts strawberries, the average size, 3½ inches in circumference, many measuring 5 inches, with but very few small ones. I have a lot adjoining said bed that promises a greater yield. I can now, June 11, count on several single plants, from 225 to 390 perfectly formed berries; they are of the Wilson seedling, set out one year since. I have had several years' experience in the cultivation of the strawberry, and have observed that each variety requires peculiar adaptation of soil for its perfect development. For instance, a light, sandy soil will produce Hovey seedling almost in perfection; while the same soil planted with the Wilson seedling will bring but a meagre crop of half-sized, acid berries.

According to our calculation, if 40 by 47 feet, which is 1,880 feet, gives 586 quarts, an acre, which contains 43,560 feet, superficial surface, will give 15,173 quarts, or 474 bushels per acre. Fortunately this statement, great as it appears, is corroborated by another. Last week, Mr. Nathan C. Ely, Dr. Trimble and Mr. Solon Robinson were appointed a Committee of this Club to visit the strawberry garden of G. K. Riker, of Stamford, Connecticut. They report that they visited the pleasant residence of Mr. Riker, on Clark's Hill, about half a mile from the depot. We found the entire strawberry patch of Mr. Riker to measure about 100 by 162 feet, the largest portion being Wilson's, the only other variety being the Austin; all the plants were set eighteen inches apart, and very vigorous, especially the Austin, and the entire bed and grounds in most excellent order. Your Committee never saw a strawberry bed of this size in finer order. All the plants were loaded with fruit of large size, especially the Austin, and as the product from the Austin, and the size of the berry and the great quantity remaining seemed to your committee so extraordinary, they present, in this statement, a detailed account in relation to that variety, and also present to the Club a sample of the berries taken from the baskets brought to market this day, and are a fair average. The entire crop of the Austin variety was sold to Mr. Delmonico, of 14th street and 5th avenue. Your Committee, in this statement, say nothing as to the relative value or desirableness of this or any variety, preferring the Club to discuss and settle that matter. The exact measurement of the bed of the Austin variety, or rather the patch of ground, is 37 by 162 feet, in beds of three rows, each set 18 inches apart each way, with a walk of two feet between. The plants, two thousand five hundred (2,500) in number, were set out about the 25th May, 1862, (the ground for several years previous cultivated with chiefly carrots, and each year manured with ordinary barn-yard manure.)

On putting out the plants, or since, no fertiliser whatever has been used. From this bed the first picking was

June 18	154	Pint baskets.
20	235	do.
22	230	do.
23	19	do.
24	16	do.
25	210	do.
26	6	do.
27	347	do.
29	260	do.
Nine pickings in 12 days	*1477	do.

And Mr. Riker estimates that there is as much fruit remaining as he has picked; but that rain will be requisite to cause all to mature.

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*See meeting of twenty-second of September.

All of which is respectfully submitted, and your Committee are willing to be continued, with the view of making a further statement as to the total crop from Mr. Riker's bed of the Austin variety, if practicable.

NATHAN C. ELY,
ISAAC P, TRIMBLE,
SOLON ROBINSON.

NEW YORK, *June* 30, 1863.

DISTURBING CORN ROOTS.

H. H. Blake, Dahlonega, Iowa, wants the Club to discuss this question: "Is it beneficial or injurious to corn (or any other plants) to frequently stir the roots by cultivating? that is, to such an extent as to tear up and break a part of them off." He says:

"It would seem more in accordance with nature to cultivate as far as may be without disturbing the roots at all, and I have heard this view taken by some, while others claim that disturbing the roots, instead of being an injury to the crop, is beneficial to it, making it grow longer and mature later; and also that it checks the growth of stalk, causing it to go to ears, thereby increasing the yield.

"Fruit growers, I believe, consider that cutting off a part of the roots of a tree brings it into bearing sooner than otherwise, but injures the tree in the long run. I should like to see a full explanation of this subject, giving facts and philosophy."

Mr. John G. Bergen.—I do not know that I can give the philosophy, but I can give some facts from experience and observation that satisfy my mind in favor of plowing corn deeply, and as long as it is safe to work among the stalks, without breaking them. Don't be afraid of breaking the roots. This has been my practice, and I have always got satisfactory results; and so have all my neighbors who pursue the same course—better than those who pursue the contrary.

Mr. Wm. S. Carpenter.—I pursue the same course, and have the reputation of growing good crops. A neighbor of mine became impressed with the idea alluded to by this letter, that breaking the roots of corn must be injurious, and got a horse-hoe and adopted surface culture. He was quite satisfied with a single experiment, as he thought his crop but little more than half what it would have been by deep plowing.

Mr. Solon Robinson—I grew a small plot of corn two years ago, which certainly was a remarkably good one, by the following mode of culture: The rows were marked by a subsoil plow, as deep as one horse could pull it. The surface was stirred while the corn was small, with Knox's horse-hoe, which is an excellent implement, and as the stalks grew large the subsoil plow was run deeply along the rows, which were in drills, at two periods, which certainly broke off all the roots pretty low down. I am quite satisfied from this and many other observations that deep culture is not detrimental to the corn crop. I am also satisfied that constant stirring of the soil is the best remedy that a farmer has to counteract the influence of drouth.

Mr. John G. Bergen.—I concur in this view of corn culture, and it is confirmed by what has often been stated here by Mr. Fuller in relation to the tap root of trees, which if cut off does not kill the tree, but causes it to throw out a mass of fine new roots; and I think it is just so with corn—that, like some trees, it is not injured, but benefited by root pruning, and causes it to produce more fruit. A crop that is neglected, or left to itself in drouth, always suffers more than one that is frequently plowed. The drier the earth, the more it should be stirred.

Blight of Pear Trees.

J. Franklin Spalding, Nashua, N. H., desires to offer the Club the following information upon this question. He says:

"Trees in this vicinity are subject to three distinct blights. 1, leaf; 2, fire or insect; 3, girdle, ring or frozen sap blight. The first attacks trees growing rapidly, causing the ends of shoots for an inch or two to blacken and die. It is often the cause of much anxiety among inexperienced persons who confound it with the insect or fire blight, which it resembles in blackening of the leaves, but here the resemblance ceases; for in no instance have I known it to injure a tree beyond checking the growth of shoots. It may be readily known from the fire blight, as that kills a limb, or limbs generally, although in one instance I knew the whole of a tree to blacken in a single night, the insect working in the body about a foot above the ground, yet generally a limb will be destroyed first, and at this stage the knife will usually save the tree, if properly used. The limb should be cut, not just to the point where the sap ceases to be colored, but at least six inches below that; for ten chances to one, the sap is poisoned beyond what is visible to the eye, and if allowed to remain, it will kill the tree. In this section trees last year suffered severely from the girdle-ring, or frozen sap blight. The first manifestation is a withering of the leaves, for which there is apparently no cause; but close observation reveals a ring of dead bark around the affected limb, hence the name girdle or ring blight; but why called frozen sap-blight, I know not, as I have seen no conclusive proof that the ring of dead bark is caused by injury received from severe cold. If caused by cold, why does it first show itself in a narrow ring two or three inches wide? The knife should be used for this as for the insect blight, but the cure will not be so certain. Having seen the insect and ring-blight, the latter especially upon slow-growing trees, I must take the liberty to contradict Mr. Carpenter's statement that slow-growing trees are never attacked by the common pear-blight, or else we have an uncommon kind in this region. In a pear-yard of about 50 trees so grass and bark-bound that they had to struggle to exist, making no perceptible growth last year, but one tree escaped the ring-blight."

Mr. Wm. S. Carpenter replied that all nurserymen concur in the opinion that it is owing to a too rapid growth that pear trees are affected by the blight similar to the one described by this writer. The Madeline is a very rapid grower, and has an abundance of immature wood at the commencement of winter, and is very apt to suffer from blight. The Seckel is a very slow grower, and is never affected.

Mr. John G. Bergen.—I do not think we have in this section the ring blight described by Mr. Spalding. We have two kinds—one which shows early in the spring before the leaves start on the ends of rapid growing-trees like the Bartlett, which turn black, and should always be cut away as soon as discovered, though it is not always a certain cure. The summer blight comes suddenly upon leaves which are apparently as healthy as any upon the tree. These leaves turn black as by a sunstroke, and all of my observations, during a good many years engaged in pear culture, I have failed to discover that the blight was caused by an insect.

The Ailanthus Tree.

Solon Robinson read the following anathema upon what the writer calls the ailanthus nuisance :

"There is an annual outcry against these poisonous trees, yet our city authorities seem unwilling to abate the nuisance, which, added to other causes, at this time of the year, increases our bills of mortality. The Ailanthus is admired for its graceful foliage, and rapid growth, (a reputation which it enjoys in common with some other pernicious weeds), and also for being of such a poisonous quality that no bird or insect can exist under its shade. Now we may take a lesson from the *instinct* of these creatures, which teaches them to avoid whatever is hurtful. Our *judgment* should lead us to remove these trees from our over-crowded cities, where we need all the air and ventilation we can obtain. Unfortunately Ailanthus trees are most plentiful where the population is the most dense. Take for example the neighborhood of Varick Place, Macdougal street, Cottage Place, or "Ailanthus Place," and the grave yard on Hudson and Leroy streets, and many other localities too numerous to mention. A malaria spreads from these poisonous groves, causing nausea, headaches, and chills. Many owners of property planted these trees on their lots in the older parts of the city, being ignorant of their qualities; but when they remove to new brown stone houses up town, they never plant the *upas tree* there. That is wise; to enjoy all the sun and air possible in those aristocratic regions. But as the sun, and the air of Heaven are bestowed on all alike by our Heavenly Father, why may not those who dwell in the localities above named, enjoy them also, and breathe more freely during our hot midsummer months, even in this crowded city?"

Mr. Solon Robinson said, I have introduced this letter for the purpose of provoking discussion, not because I agree with this writer, for I hold quite the contrary opinion. I am aware there is a short period during which the odor of the ailanthus blossoms, and I am also aware that trees in a city are among the necessities of life, and this species can be easily grown where no other will exist. I do not believe the effluvia of the ailanthus is malarious, and if injurious to health only so in a very slight degree. I believe the growth of these trees absorbs ten times as much malaria from the streets as it is possible for them to give forth from their blossoms. It is a law of Nature that growing plants purify the air. Without them man could not exist upon the earth. Without them in cities, people cannot enjoy health. I should consider the destruction of the ailanthus trees in cities, simply because the odor of the blossoms is unpleasant to the olfactory nerves of a few persons, an act of as great barbarism, as it would be to cut down all other shade trees, because they are infested with caterpillars for a few days in the year. I also recommend planting ailanthus trees in desert places, where the soil is too poor to grow any other kind, for the production of fuel and timber.

Mr. Nathan C. Ely replied that he had found it next to impossible to season the wood for fuel, and if burnt in an unseasoned state, in an open fireplace it emits a very unpleasant odor. He also thinks the pollen which is blown from the blossoms about the streets, where it gets into people's eyes is a greater nuisance than the odor. Yet great as the nuisance may be, he will not recommend cutting down the ailanthus until some better tree can be found as a substitute.

Mr. John G. Bergen.—I concur generally in the views expressed by Mr. Robinson. The ailanthus is the tree for the city. I would not plant it upon a country place because we there can grow fruit or other trees which cannot be grown in cities. I think this writer is mistaken in several things. I do not think the tree is generally considered a great nuisance. He jumps at false conclusions, and thinks the tree deleterious to man because birds and worms avoid it. This is not so. Birds make their nests in it, and of late years it has been infested by worms. There are no facts to prove that it has ever caused sickness. The odor is disagreeable, but it is not as much so as chloride of lime. That neutralizes miasma. Who knows that the odor of ailanthus blossoms does not neutralize more miasma than it creates? As for fuel, if cut in winter, it will season readily, and is as good as any other soft wood.

Mr. Carpenter.—This man's argument based upon worms not eating the ailanthus, is a very weak one. I have a large tree that has been almost denuded the past season, and birds have made their nests in it for years.

Mr. Nathan C. Ely.—I should like to know if the writer of that letter has been the cause of the destruction of eight or ten ailanthus trees in Sixth avenue, which have lately been cut down; and other in the same neighborhood, which afford a broad and agreeable shade to many a weary passenger upon the street, have been girded for the purpose of effecting their destruction.

Adjourned.

John W. Chambers, *Secretary.*

July 7, 1863.

Mr. Nathan C. Ely in the chair.

Drought.

Mr. Wm. S. Carpenter.—I understand from conversations had with farmers and gardeners, in Westchester county, that something may be done with young trees that are now suffering with the present drought. I have a number of young trees that have not yet thrown out a leaf; I shall set my men at work, stirring the earth, digging round the young trees, say six feet in circumference, and apply mulch round the stem, and this should be done in the course of a week or ten days, by this means nearly all the trees that are now alive can be saved; some persons apply water, but it should not be done except the trees are mulched.

Compost Manures.

Mr. R. L. Pell.—From the numerous changes that are constantly taking place among bodies in nature, and the new combinations that are formed in consequence of them, a great variety of substances are elaborated, and prepared for the support of vegetable life.

Some of the matters which they contribute possess volatility and fluidity, such as water, and sundry gaseous materials, as hydrogen, oxygen, azote, and carbonic acid gas in different states of combination. Heat, light, and particularly electricity, are indispensably necessary to the well being of plants. These are formed and applied in the soils on which the plants grow, in greater or less proportions, according to the season of the year, the nature of the climate, in regard to cold and heat, and the state or situation of the ground in respect to its quality; while others are more gross, and require to be applied and incorporated with soils, or spread out upon their surfaces, in order that they may produce their effects in promoting vegetation. It is chiefly to these, as being the means of sustaining different sorts of plants as crops, that the term manure has been given by practical writers on agriculture, though it is obvious that they must undergo different changes, and be resolved into elementary principles, before they can be taken up and contribute to the increase and support of vegetables. In the various materials which the art and industry of man have rendered capable of being beneficially employed in this manure, there is great diversity; some are found to yield the matters more readily than others that are necessary for the support of plants, as animal, vegetable, and all such substances as are rich in mucilage, saccharine matters and calcareous earth, and readily afford carbon, phosphorous, and some of the ærial fluids that have been mentioned. While others are deficient of these principles, or do not readily part with them, when employed as manures. This is the reason why some substances when put upon ground, are so superior to others, used at the same time, and in the same manner and proportion, a circumstance which is often observed in the practical details of husbandry. Some substances not only promote the growth of plants, but likewise add to the quantity of vegetable and other matters contained in the soils on which they are distributed, and consequently provide for the reception of the roots of plants, others operate upon the materials contained in the roots of plants, breaking down their organization, and setting at liberty volatile and other ingredients, by which new compounds are formed and brought into such states as are the best adapted to the support of vegetable life. Others again produce certain changes and alterations in the texture of soils, such as rendering them more open and porous, or more compact and stiff, and thus fitting them to bear different vegetable productions. And there are others that contribute in several of these ways at the same time, hence manures may be divided into compound, animal, saline, vegetable and fossil.

SOFT ANIMAL SUBSTANCES.

There are various matters of this nature that may be made very useful in the compost heap for the purpose of improving land, some of which have been but little attended to, except by a few farmers. Among these may be mentioned greaves, or the residuum which is left after making candles, and the scum which forms on the top of boiling sugar. Though these substances are dear, still they will go a great ways and produce lasting effects. In the compost heap you may blend both these matters in the proportion of four of mould to each of them. And when used as top dressing, it will never fail to produce a full crop of grain, or hay, and a rich sweet aftermath. If salted fish, that have been spoiled on shipboard, are added to the compost heap, grass will be rendered so rank that depasturing cattle will not eat it till mellowed by the following winter's frost. If not placed in the compost heap, it will be found that the combination of lime with greaves, mixed with the mould from headland, will make a highly active manure. Lime combined with woolen rags, or with night soil, and then mixed in the compost heap with charcoal dust, will produce a favorable effect in the support of vegetable crops. And they will be lasting, because some of their properties will be absorbed by the charcoal, during the time of their decomposition, and afterwards parted with slowly in the soil.

The Arabians, who are noted for taking great pains to improve their lands, are accustomed to make large pits, in which they place animal substances, and cover them with calcareous earth of the most sterile kind, which soon acquires the properties of the richest manure.

I once formed a compost heap consisting of pigeon's dung, refuse from a glue factory, the cuttings of felt manufacturers, the clippings of furriers, feathers, greaves, piths from bullocks' horns, blood, scrapings of oiled leather, and waste of shoemakers. I found these materials, when decomposed, were capable of being mixed with six times their weight of muck, or mould, and as they abounded in oil, mucilage, and other matters soluble in water, they contributed in the most wonderful degree to the support of vegetation. Another compost heap was formed of small fish, offals from hogs, refuse from a slaughter house, charcoal dust, bone earth, hair, fresh water muscles, and barn-yard manure. These were capable of affording much elastic volatile matter to the earth mixed with them, making the whole mass inoffensive and highly advantageous to the growth of vegetation, so much so that a poor soil without it yielded 40 bushels of oats to the acre, when a portion of the same with it produced 75, and besides being so superior, the crop was ten days earlier. I discovered further that the crop was finer where 26 bushels were used, than that top dressed with 56. The reason was that the proportion of earthy matter in the field was just sufficient to reduce the ammonia, and other matters contained in the compost added by the 26 bushels, and adapt it to the support of vegetation, but not the 56 bushels.

ANIMAL DUNGS.

The animalized substances are most generally made use of as manures, which on all farms are found in very different conditions, proceeding from the kind of food on which the animal has been fed, the matters with which they are incorporated, and the texture of the substances themselves. The excrement of fat animals possesses much greater powers of fertilization than the excrement of lean ones. When an animal is fed on oily seed, it will be the most rich, next on turnips, carrots, &c., next hay, and the poorest of all on straw.

When the excrementitious matters from privies is made use of in the compost heap, large quantities of muck, for the ammonia and volatile alkalis to exert themselves upon, should be used.

The results of experiments carefully made with these matters in the compost heap, convince me that inconceivable loss is often incurred by the inconsiderate practice of the generality of farmers, who permit the fluid parts to escape from the bottom of the heap and run away. When, if properly husbanded and applied to the field, it would produce forage capable of fattening the largest sized cattle in much less time than any other.

It will be found that the excrement of those animals which feed on the food that constitutes the diet of man, is the most effectual in promoting vegetation, when applied to the ground. Hence it follows that the manure of dogs, swine, carnivorous birds, pigeons, turkeys, and other poultry, produce powerful effects. When these matters are placed in the compost heap putrefaction immediately commences, and the carbon contained in them is changed into carbonic acid gas, and their water is decomposed as is evinced by the strong smell of hydrogen, this process makes them capable of being taken up by the roots of plants.

The substances of the vegetable kind that may be converted into manure, are so exceedingly numerous that it would require pages to describe the whole of them. All known green vegetable productions, river, lake, pond and ditch weed, the refuse of garden vegetables, haulm of potatoes, buckwheat, rye, wheat and barley straw, &c. All the weeds on a farm may be cut down in their juicy state, just before the blossoms appear, when they are in the best possible condition to become immediately putrid, and at the same time the injury that might be sustained, if they were permitted, as they generally are, to go to seed.

Immediately as these several matters are collected in a heap, blend quick lime with them, and cover with mould, in order that the matters afforded by the dissolution of the weed, may have something to act upon, thus enriching the compost heap, and rendering its effects more permanent when spread upon the land.

The refuse from tanning establishments in the shape of fine bark from the hemlock tree, may be employed as a manure, composted thus: collect it when fresh, first into moderate sized heaps, in a place protected from exposure to wind and the suns' rays, mingle with it quick lime in the proportion of one bushel to ten, and moisten it slightly with water, then mix with it sea weed, if you can get it, the mud from the bottoms of ponds, rivers and stagnant places. Turn the heaps twice, and then form them into large heaps, and continue turning once a week until the whole is reduced to a considerable degree of fineness. Then add a few loads of rotten horse-dung to promote and render the decay of the mass complete. In using manures thus prepared as top dressing for grass land, they should not be spread on too thickly, or in too large portions at one application, as sometimes injury is done to the succeeding crop, the grass not being able to tiller.

A rich and admirable manure may be composted as dressing for orchards thus: take two tons of saw dust, and incorporate with it the dust screened from malt, crushed seed left after pressure in oil mills, the refuse from cider mills, soot, ashes and stable dung, with a small portion of lime, salt, and half a ton of refuse oil cake; when these matters are sufficiently decomposed to cause a pungent ammoniacal perfume to arise from the heap, cover it with charcoal dust, or muck, which will retain the gases; when applied, dig a space four feet in diameter around the tree, place in about two bushels of compost and cover it.

ANIMAL MANURES.

Substances of the animal kind, when reduced by the process of putrefaction, or other means, into a soft, pulpy or mucilaginous state, are found by experience to afford those matters which are suited to the nutrition of plants with greater readiness, and in more abundance than most other bodies that can be employed. By chemical analysis it has been shown that the component materials of these substances, so far as agriculture is concerned, are chiefly water, jelly or mucilage, and oleaginous matters, with small portions of saline and calcareous earthy substances.

Hence animal substances, though they agree in some circumstances with vegetable productions, each having, in common, water, saccharine and calcareous matters, are far more compounded; and in animal substances some of these materials are in large proportion, while in vegetables they only exist in a very small degree; and the jelly which, in some measure, resembles the gum and mucilage of plants, differs likewise from them in its having much less tendency to become dry, as well as in its property of attracting humidity from the atmosphere, and of running with great rapidity into the state of putrefaction and decay. All these principles of animal excrement are resolved by their ultimate decomposition into other matters, such as the different gaseous fluids, &c. It would appear probable, too, that in animal substances of different sorts there may be differences in regard to the proportions of these several ingredients. Some kinds affording one or more of them in greater abundance than others, while others again are deficient in these, but abound in some of the others. On this supposition the different effects of substances of the same class, when applied to soils of the same kind, may be easily accounted for.

HARD ANIMAL SUBSTANCES.

In the matters of this sort that are employed as manures, there are differences in respect to their texture and firmness, some being quite solid and firm, such as bones, horns, hoofs and other similar substances, while many are more soft and pliable. The bones of all animals are capable of affording much nutritious matter to plants, but those which are procured from cattle that have been killed when fat, are the best for the purposes of manure. Those which have been boiled are far inferior, in this view, to those which have not undergone that process, as by such means they are principally robbed of their oily and mucilaginous properties, and consequently must yield much less nourishment to the immediate crop, whether it be grass or grain. All these substances require to be ground down, or dissolved with sulphuric acid before they are placed in the compost heap, otherwise they will decompose so gradually as not to yield a full supply of nourishment for supporting the crops. Bones are constituted of a large proportion of mucilaginous or gelatinous matter, a slight proportion of fat, and an earthy salt composed of the phosphoric acid and calcareous earth. When heat is applied to them they afford a large quantity of carbonic acid gas, hydrogen gas, and a volatile alkaline liquor. From the nature of these different principles, it is evident that they are capable of promoting an admirable effect when mixed with vegetable mould in the compost heap, by forming new combinations highly favorable to the process of vegetation. The usual mode of consuming bony substances, by means of fire, for the purpose of obtaining their ashes, is a wasteful practice which ought not to be attempted by farmers, as by it the oily materials are driven off, and nothing remains but phosphate of lime. Compound manures, or those combined with different substances that are capable of being made use of as enrichers, may be mixed and blended with each other, or with substances of other kinds, and by such means be increased in quantity, besides being rendered more suitable and effectual for application than in their simple states. The general experience of farmers has fully shown the great utility and importance of employing compound manures, or composts. Farm yard manure, which is the most general application of any, from its being formed by the decay of various kinds of vegetable matters, such as hay, straw, cornstalks, and other materials of a like nature with which the urine and dung of animals is combined and incorporated, must be considered as a compound substance. But from most of the vegetable materials being made use of in a hard and dry state, they do not so quickly ferment or run into the state of decay, notwithstanding the proportion of animalized matters that may be incorporated with them. It therefore becomes a useful practice to turn them over, by which their complete putrefaction may not only be promoted, but the different materials be more minutely blended together, on both which accounts they may become more useful when applied as an enricher to land. Where animal matters are collected and thrown together in any quantity, there can be but little doubt but that a great increase of good manure may be provided by mixing with them rich surface mould, peat earth, or the scrapings of roads; by such a practice the ammonia formed during the decomposition of animal substances is prevented from escaping, as would otherwise be the case, which combining with and acting upon the earthy materials, quickly renders them proper for the purposes of manure. As substances of the animal kind run very rapidly into the state of putrefaction, they may often be incorporated with such vegetable materials as are little disposed to rot or become putrid, and by such means useful composts may be expeditiously formed. Earthy materials may be made use of to a great extent, where the manure to be mixed with them is of the animal kind. The following table of manurial substances shows the number of loads of dry, or moist manures that is required to equal one hundred loads of barn-yard, so far as the quantity of nitrogen they contain is concerned:

Wheat straw	dry, 600	wet, 160
Rye "	" 975	" 240
Oat "	" 550	" 140
Barley "	" 740	" 165
Potato tops	" 85	" 70

Carrot tops	dry,	64	wet,	46
Green beet "	"	42	"	78
Sea weed "	"	139	"	46
Flax cake "	"	31	"	8
Rape cake "	"	32	"	9
Refuse from starch	"	106	"	104

The straw of wheat will yield 45 parts of ashes from 100 parts, and the 100 parts will give by analysis—

Silica	62.2
Soluble salts	21.4
Earthy phosphates	4.1
Metalic oxides	1.1
Earthy carbonates	11.2
	100.0

Barley straw, from 100 parts dry, gave 41 parts of ashes, and 100 parts analized yielded :

Earthy phosphates	1.75
Silica	56.00
Metalic oxides	10.04
Earthy carbonates	13.06
Soluble salts	19.00
	.15
	100.00

Rye straw from 100 parts gave 30 parts ashes, and 100 parts ashes produced :

Earthy carbonates	2.0
Soluble salts	2.2
Earthy carbonates	11.0
Earthy phosphates	25.0
Silica	59.0
Metalic oxides	.8
	100.0

The nitrogen in manure is an organic element to which must be attributed its principal enriching quality. The formation of nitrates and the production of ammonia is due to it. Consequently we estimate the value of manures by the quantity of nitrogen contained in them. This is the chief cause of the enriching properties of dung. Whence then is it derived, if raw potatoes are fed to stock, they only contain a third of one per cent. of nitrogen, hay one and a third per cent., oats one and nine-tenths per cent, or one hundred pounds of each contain five ounces, one pound five ounces, and one pound fourteen ounces respectively. It would seem at first sight that this minute quantity could be of very little importance to the plant, especially as it does not enter as a constituent into the vegetable substances, such as starch, sugar, &c., which plants yield in the greatest abundance, and of which their stems chiefly consist. But the consideration of the quantity of nitrogen contained in a whole crop, will satisfy any one that though small in comparative amount, it performs its share of importance in reference to vegetable production. Two tons of hay growing upon an acre of land will contain sixty pounds of nitrogen. A cow will eat twenty-six and a half pounds of hay in a day, and will evacuate thirteen pounds of solids, containing only 3.02 of nitrogen. The hay contained 1.66, showing that more than twice the amount of nitrogen contained in the hay consumed was voided. A milch cow cannot be fattened by giving milk, because the nitrogen escapes in her milk. The value of all excrementitious substances depends to a certain extent upon the food given to the animal, and if it is fed upon green food during the summer in confinement, it will possess more than twice the strength of that derived from a stall-fed animal in the winter season. Ten loads of manure from an animal fed on oil cake, is worth twenty loads derived from an animal fed on straw, hay, &c. How is it that the dung and urine are richer in azote, or nitrogen, than the food from which they are formed? The question is readily answered. The largest proportion of any vegetatable is principally carbon and woody fibre. A cow lives chiefly upon vegetables, and discharges from her lungs in the act of breathing, a large percentage of the carbon her food contained, consequently that left in the system to be thrown off by the kidneys contains a large quantity of nitrogen, which could feebly be supplied to the soil from rain water falling from the clouds. All the nitrogen contained in the food beyond the requirements of the animal's system, is thrown off principally in the urine. In the vegetable matters consumed by the cow, the carbon was to the nitrogen as nine to one; but after the lungs have performed their duty the proportion is only two to one. From the residue, rich in nitrogen, the several parts of the animal body are built up. When a cow dies her animal substances resolve organized forms into elementary constituents, and the horrible effluvia disengaged during the process, points out to the farmer the propriety of covering them with soil, where they may readily become the food of vegetables. If such organized substances are permitted to putrefy in the open air the process becomes noxious; but beneath the surface of the earth their sulphuretted gases soon become the constituent of a rose's perfume, and fill the air with the most delicious fragrance. The fertility of all soils is supposed to depend upon humus, this is incorrect, as humus is vegetable mould, the product of the decay of other plants, of which water will not dissolve more than the hundred thousandth part of its weight. Decayed wood produces the same results. When we place in our compost heaps vegetable matter, it undergoes first fermentation, and then putrefaction. Decaying roots, stalks and grass decompose in a manner analogous to combustion. The leaves which fall in the forest in the fall, and the spongioles of grass in a meadow, are converted into humus in the same manner, which, after its formation, does not nourish plants in a direct manner by being taken up in an unaltered state, but by yielding a permanent source of carbonic acid gas which the roots absorb, and receive nourishment from during the period they are destitute of leaves, until they form which, they are incapable of imbibing food from atmospheric influences. The urine of animals is the most powerful for all vegetable life, because it contains so large a percentage of nitrogen, being infinitely more than is discovered in the solid evacuations. With this knowledge, is it not shameful in farmers to permit it to escape from their stables and cow sheds, to form ammonia elsewhere only to fly into the air for the enrichment of some neighboring farm? It is inexcusable for a farmer not to employ all the matters on his farm containing nitrogen, particularly those in the shape of animal excrements, in his compost heap, and as these matters are constantly emitting carbonic acid gas and ammoniacal substances, as long as they contain nitrogen, he must cover the heaps with muck, or charcoal dust, which will absorb and retain them as they rise. The ammonia contained in manure placed upon the soil, is imbibed by it either in the form of gas or in solution in water, and thus plants receive a larger portion of nitrogenous compounds than is usually afforded them by the surrounding air. The object of orchard culture, if that be the farmer's taste, is to produce as much carbon as possible to form woody fibre; if field culture, to add as much nitrogen, in the form of ammonia, as the plant can possibly absorb.

MANURES OBTAINED BY THE DECOMPOSITION OF FOSSIL SUBSTANCES.

Matters that are to be considered under this head, when composted, produce more or less powerful effects in promoting the growth of vegetable crops, according to the state and quantity in which they are applied, the nature of the soils on which they may be employed, and the properties of the matters with which they are combined; notwithstanding these matters have been long used, still there are some difficulties to be overcome concerning the manner of their operation. It has been found that where magnesia is in union with calcareous matter, it is by no means so beneficial as a promoter of vegetation, as where no such combination is present, particularly when used in the same proportions. If we obtain lime from different lime stones, shell, corals, or chalk, though it may be apparently of the same quality, still its effects will vary very much when employed in agriculture. Lime often, when placed in a compost heap in its pure caustic state, in large quantities, retards the process of putrefaction, which it was intended to hasten, and still when used upon the land destroys snails, worms, slugs, grubs and insects, which abound in rich soils, and thus they are made to furnish much nutritious matter for the growth of vegetation. And from its having a tendency to combine with mucilaginous oily matters to a greater degree than with fixed alkalies, a kind of soap is sometimes formed that probably contributes in its liquid state to the nourishment of plants. The states of chemical combination in which lime may be applied to the compost heap, are as quick lime precisely as it comes from the kiln, uncombined with either water or carbonic acid gas. Hydrate of lime in which it has been made to combine with one quarter of its weight of water. In both these states it is caustic lime. Spontaneously slaked lime in which one part is combined with water, and the other with carbonic acid gas and carbonate of lime, which is the state in which it occurs in nature and to which burned lime, after a certain period, arrives. Bi-carbonate is a fifth state of combination, when it is combined with a double proportion of carbonic acid gas, and is partially soluble in water.

Magnesian limes may also be in the state of calcined magnesia, of hydrate of magnesia, or a compound of hydrate with carbonate or bi-carbonate of magnesia, which latter dissolves in fifty times its weight of water. Carbonate of lime is applied to the compost heap in its various natural forms, of these marl occurs most abundantly, and is extensively used in every part of the world where agriculture is carried on extensively. Marls are of many colors, yellow, blue, gray and white, and of various degrees of coherence arising from the earthy matters they contain, and the nature of their locality. Their efficacy is due to the carbonate of lime contained in them in the state of powder, which is diffused through the mass. The experience of every farmer that I have spoken to on the subject of marl and lime, is that it has proved far more enriching to land when composted, and a much smaller quantity placed on the land in this form, will produce an equal effect with a large quantity put on alone, probably, for the reason that rain cannot act upon it in compost as it would in the open soil. The older the compost containing lime is the more fertilizing will be its action, and it will be perceived more sensibly the second and third year than in the first, particularly when applied to the driest and lightest soils, and to such that does not abound in vegetable matter. These substances supply inorganic food, which is indispensable to the well being of all cultivated plants. They neutralize acid substances which are in the compost, and render them harmless, they change the inert vegetable matter into useful mould, and facilitate the production of inorganic and organic compounds in the heap, promote their decomposition and speedily prepares them to enter into the circulation of plants.

The following crops contain lime as mentioned below :

25 bushels of	wheat	growing upon an acre	8 lbs.	
39 "	barley	" "	16 "	
60 "	oats	" "	9 "	
30 tons of	turnips	" "	139 "	8 oz.
10 "	potatoes	" "	265 "	1 "
2½ "	clover	" "	130 "	2 "
2½ "	rye grass	" "	34 "	1 "

All these crops require that lime should be used in some form in the compost heap, otherwise their functions will be delayed in the performance of their duty.

The agency and decomposition of saline matters are necessary constituents of the compost heap, as they are found in numerous instances, when employed properly to contribute largely to the support and growth of vegetation. The materials generally made use of in this way are the refuse of bleaching and soap-boiling manufactories, peat, pit coal, and wood ashes, sea salt, soot, &c. The different alkaline principles contained in these substances, form the facility and power which they possess of acting upon and dissolving the parts of vegetable and animal matters, particularly such as have been rendered insoluble by absorbing oxygen. When they are combined in the compost heap, they are usually found to be the most advantageous and useful upon stiff clay and loamy soils, where they contribute to increase the crops by furnishing such soluble matters as can be readily taken up by the absorbent roots of plants, after the stiffness and tenacity of the land is lessened.

Soot is an admirable substance to add to the compost heap, because it contains a considerable proportion of alkaline salt, and forms in union with an alkali, a better oleaginous liquid, with which it impregnates the compost heap, which in turn imparts it to the plants, and causes them to be rejected by insects, besides promoting a rapid vegetation, and thereby rendering the texture of the plants, very rapidly, too firm to be preyed upon by those not disliking the acrid taste. If this composition is sown over a wheat crop, that has turned yellow, and presents a sickly appearance, it will immediately assume a healthy green, and grow vigorously, besides all this, it will eradicate moss. Its great state of fineness and tenuity is serviceable, as by that means it becomes capable of being more extensively and more regularly mixed with the compost heap. In fact, the good effects derivable from most substances employed in composts for top dressings, depend in a great measure, upon this circumstance. Where soot, ashes, or in fact any material that contains saline matters, intended to be employed as manures, should always be preserved under cover, free from any accidental application of water to them, as where this practice is neglected, the saline substances are dissolved and carried away in a liquid form. It is from this cause that farmers have complained to me that they have derived no sensible advantage by the application of salt, soot, &c., to their compost heaps, made up in exposed situations, and freely watered. On this account such composted materials should not be used as top dressing very early in the spring, as then valuable properties are carried away by the rains, particularly if the ground is not underdrained, and sub-soil ploughed; if it is, there is not so much to be apprehended on this account.

I once offered to cut all the mullens, thistles, weeds, flags, &c., on a neighboring farm, and to carry off what the farmer considered a great nuisance, the hair left after scalding his hogs, for several years in the same place; he agreed gladly to let me have them, but asked what use I intended to convert them to, and on informing him that they would make, when composted, a rich and highly fertilizing manure, he refused to let me take them, though he neither cut the weeds or used the thistles himself. They should all be gathered with much care, and placed upon the compost heap, and in fifteen or sixteen days thereafter, if properly managed, every 1000 lbs. will yield 3500 lbs. of manure. And the bulk may be wonderfully increased by the addition of muck or earth from the head-lands. If your muck swamp is a good one, you should always dig one year in advance, and when used in the compost heap, one part of straw, weeds, or any other similar substance, will be equal to two parts of muck, if mixed with a small portion of horse manure, the fermentation will destroy the seeds of any weeds that may be used. If the heat rises higher than is desirable, a portion of water will arrest it.

An admirable mixture for the compost heap is as follows: to every hogshead of liquid add 16 lbs. of slaked lime, 16 lbs. of wood ashes, 10 lbs. of salt, 10 lbs. of potash, 1 lb. of saltpetre, 80 lbs. of plaster of Paris, 40 lbs. of excrement, 100 lbs. of urine, and 80 lbs. of horse dung. When the heap has been raised fifteen inches high, stir the liquid and pour it on until the mass is saturated, and place another layer, and continue thus until the heap is nine feet high. When completed cover it with charcoal dust. After a week has elapsed make holes in the heap with a crow bar, and fill them until the whole becomes wet, with compost water, and make new ones the following week ; three such waterings within twenty days will make the whole fit for use. If you cannot obtain liquid manure for this purpose, water will do. When farmers have desired hippuric acid in their compost heaps, they have only applied the liquid from their horses, whereas that of nearly all animals contains it, and it would be difficult to find an animal, except the cow, that affords more liquid, or one richer than the despised hog. But of all the liquid evacuations, there are none that surpass those of man, a thousand parts of which, by analysis, contains 43¼ lbs. of salts, and will produce twice the effect of any other. And when we consider that each man evacuates, yearly, a sufficient quantity to make an acre of land rich enough to support him, the loss from the whole family of a farmer's household is enormous.

Potatoes may be increased 46 times, and Indian corn 36 times by the use of this enricher, by applying it to the plant instead of the soil; thus, first, when the roots start, second, when the leaves shoot forth, and third, when the fruit is formed. And this production may be much increased in corn by soaking the kernels in dilute urine until germination appears, this will not only hasten the growth, but protect the plant from the attacks of insects. If it is admitted that the liquid and solid excrements of man amount to 1½ lbs. daily, ¾ lb. of urine, and ¼ lb. fæces, there will be contained in that amount 3¼ per cent. of nitrogen, they will then amount to 550 lbs. in a year, which contain nearly 7 lbs. of nitrogen, a quantity sufficient to yield all that would be required by 801 lbs. of wheat, or 901 lbs. of barley. While these invaluable matters are permitted to remain on the farm in the receptacles prepared for them, the greatest part of their urea is converted into carbonate of ammonia, lactate and phosphate of ammonia, and the vegetable portions lose by putrefying; then sulphates are decomposed, while the sulphur contained in them forms sulphuretted hydrogen and hydro-sulphate of ammonia. The mass has then lost by exposure to atmospheric air half of the nitrogen originally contained in the excrements; the ammonia escapes with the water when it evaporates. Notwithstanding it is still a valuable manure, but would be four times more so, if the excretia had been neutralized before being dried. A covering of charcoal dust will always preserve these valuable principles.

In all compost heaps it would be well to use such substances as contain nitrogen or azotized matters, because they enter spontaneously into the states of fermentation, and small quantities possess the remarkable power of causing unlimited quantities to pass into the condition of putrefaction. A pint of grape juice in the act of fermentation, added to one hundred pints of the same fluid induces immediate fermentation in the whole mass. So a thimblefull of putrefied milk, thrown into a hundred quarts of fresh milk, would cause the whole to pass rapidly into the same condition. When you find a compost heap is prone to fermentation you may rest assured that it contains nitrogen. All those substances which appear in the compost heap to possess the property of entering spontaneously into putrefaction, do not really suffer those changes without having their elements disturbed. Eremacausis invariably precedes putrefaction after the absorption of a certain quantity of oxygen. Organic substances cannot undergo spontaneous change without the aid of an external cause. Before they assume a state of change, the existing equilibrium of their elements must be disturbed, and the most common disturber is the atmosphere.

A compost manure may be formed by mixing bone dust and a solution of the silicate of potash together and permitting them to become perfectly dry, and then add 12 parts of charcoal dust with 20 parts of common salt, that will supply nearly every inorganic substance required by either oats, barley or wheat. If the straw of wheat, rye, oats and barley are burned to ashes, and these used as a manure for either of those grains, the stems will be found to possess an extraordinary strength; but if used upon potatoes, or any leguminous crop, they will not exert the least influence in any way. If the composted manures are intended as a top-dressing for wheat, there should be no plaster made use of in them, because it will invariably cause the stems to become covered with rust. Though it will be a great addition to the young clover that may be sown with the wheat, ashes in the compost heap will make the straw to produce rich grain, and leguminous plants to grow luxuriantly, because it contains both phosphate and potash. If one per cent. of green vitriol, or sulphate of iron, be added to a compost heap, the mass will exert a poisonous action on all the plants it may be used upon; these evil effects, however, may be counteracted by an application of lime. If protoxide of iron be added to the heap, it will cause any land upon which it may be used, to become perfectly sterile.

MEANS OF AUGMENTING AND PRESERVING MANURES.

On proper attention being paid to the increase of manures, and the modes of preserving and managing them in a great measure depends the general fertility of farms, and the luxuriance and goodness of the crops grown upon them. It is therefore a matter of the first importance for the agriculturist to see that nothing is wasted that can, by any means, be converted to such a purpose. There are an immense number of substances that may be advantageously used by farmers, that are little regarded, and often permitted to be carried away by rivers, or consumed in other wasteful manners.

Another cause of loss in the production of manures, is the want of adopting such modes of management, in respect to different substances, as are capable of rendering them fit for the purpose of application, in the most expeditious manner. What is necessary to be done to hasten the decomposition and reduction of different materials into proper states for application to the soil, we have already seen to be the free admission of air, water suitable to the conditions of the matter made use of, and a proper degree of heat. And also by the proper blending of animal with vegetable substances, in the incipient stages, and the addition of lime, according to circumstances, and in proportions suited to the nature and state of the ingredients.

As the principal resource, on the generality of farms, for the manufacture of manure, is the barn yard, it should be constructed in such a manner as that everything may, with facility and ease, be converted to the desirable purpose. The parts of the farm yard, where the compost heaps are made, should be accessible to air and moisture, and be convenient for depositing the dung from the sheds and stables, without being too elevated, so as to cause it to become soon dry, or so greatly depressed as to favor the stagnation of water upon it, and thereby deprive it of the properties most essential to the promotion of vegetable growth. Before each of the dung heaps a reservoir should be made, into which the drainings may empty themselves. Without these, much loss of manure must occur daily from the liquid matters of such places' continually running away, and being in other ways wasted, as well as the impossibility of making use of them to forward the conversion of other matters into the condition of manures. Where these and such other suitable accommodations as have been described, are provided, the farmer will have nothing to do except to provide such matters as may be suitable for the purpose, and cause them to be properly placed, that they may speedily be reduced into the state of manure. With this view various vegetable matters, such as leaves, rushes, pond weed and other aquatic plants, straw, hay, flags, and coarse grasses and weeds, should be preserved and collected in as large quantities as possible, by permitting nothing of the kind to be carried off the farm, unless you may be situated near a town where other matters can be bought to replace them. The stubble from grain fields, leaves from the woods, coarse grasses, weeds, &c., should be mowed when in a juicy and succulent state, dried and carried to the farm yards, and there stacked in convenient places, for the purpose of being used as litter.

Besides these means, there are others that equally demand attention; every leisure opportunity should be taken, before the foddering season commences, to bring into the barn yard rich surface mould, muck, marl, dry mud from ditches, ponds, &c., scrapings from roads, and other similar substances, as can be obtained, to be used as foundations for the compost heaps, as well as to be deposited in the cisterns, for the liquid matters in them to act upon. When the cattle are confined in their stalls, thick litterings of one or more of these materials should be placed in them, and after they are broken up, and reduced, may be placed in the compost heaps, by which means their decay may be rendered more quick. If the textures happen to be hard and ligneous, their reduction may be expedited by means of a small quantity of lime sprinkled upon them. To render this plan effectual, all the cattle on the farm should be strictly confined to the yards during winter, and not turned out as they generally are, into the pastures, by which much injury is often done by poaching, and the making of much manure prevented. Besides all this the stock are injured by cold and other causes. At the close of the winter and early spring, when the cattle are turned out of the yards, the compost heaps, which have been collected together, must be thoroughly turned over, in order that the animalized matters may thereby not only be still more incorporated with the earthy substances, but also, that atmospheric air may be retained among the clods, and thus induce the putrefactive process to become more complete, and readily combine the oxygen with the carbonaceous material of the dung, as well as the nitrogen with hydrogen, as such matters constitute the most beneficial properties of the compost heap. On these accounts, as well as others that have been mentioned, the compost heaps should not be made too large, but of such sizes as will enable the farmer to turn them expeditiously, and cart to the fields one at a time, without injuring the others by any delay that may occur from causes unseen. Every barn yard should be supplied with light, movable covers, to place over the compost heaps, and effectually screen them from the action of the sun in summer, and heavy rains and snows in winter, as the manures thus sheltered have invariably been found by agriculturists to be far more efficacious in promoting the growth of vegetation than under other circumstances.

Different plans have been pursued by farmers, to procure manure from the articles of food and other substances produced on the farm; by some it has been contended strenuously, that the best plan is to have the whole of the straw, hay, &c., consumed by farm stock, without employing any of them in the way of litter, the stall floors being so constructed that the animals can be kept clean and dry, without being littered, with straw, or other similar materials; while other farmers declare, on the ground of long experience, that the method of eating the hay by the stock, and employing the whole of the straw, as well as other similar substances, in the way of litter, is, by far, the most effectual in promoting the increase of manure. It is probable, however, that a judicious combination of both may be the most beneficial.

In my opinion, the soiling of horses, cows, and cattle generally, with rich green food, cut fresh every day during the summer season, and placed in foddering yards, the bottoms of which have been prepared and covered to the depth of five or six inches, with earthy materials and litter, is a practice by which great additions may be made to the compost heaps, as the evacuations of stock fed in this way is very great. Farmers cannot be made to believe, without trying the experiment, how few acres of land, under the culture of artificial grasses, when cut green and daily fed to working horses and farm stock, will answer the purpose. The quantity of manure that may be made in this way, is far greater than can be supposed by those who have not actually made a trial of the method. Four hundred sheep soiled in this way will make manure amply sufficient to enrich an acre of land daily.

When we form our compost heaps, changes continually take place in them from the instant the heaps are thrown together, to the period in which they are reduced to a black carbonic earthy matter, and in nearly all the different stages through which they pass in the process of decom position; such substances are formed as are capable of contributing to the support and nutrition of vegetable growth. Science alone can truly explain the mode in which certain substances exert their beneficial agency, consequently the practical agriculturist must be directed rationally by science, all besides is mere experiment, conjectural, hazardous, and exceedingly expensive. The manures that are left upon the barn-yard become only comparatively decomposed, and may be used advantageously on crops that require a supply of nourishment for a considerable length of time, therefore their gradual decomposition, near the surface of the ground, affords a regular and durable supply of nutrient materials, which contribute effectually to the growth of crops, particularly potatoes which require much room to shoot out their roots and extend themselves, and this is afforded by the gradual and slow decomposition of long manures, when slightly deposited beneath the surface of the soil; there is also much less waste of elastic matters and heat which contribute so largely to the growth of potatoes. On this principle the ploughing under of fresh vegetable crops in their succulent state, is often a more economical, as well as more beneficial practice, particularly in dry, light sandy soils that will admit of their gradual putrefaction and decay, than to cut and take them off for the purpose of being converted into manure in the compost heap.

As to the season in which manures may be placed in the soil, or spread upon the surface, with the greatest advantage and benefit, though in practice, it must depend upon the state of the land and convenience of the agriculturist, should in cases where they are buried under the surface be, as nearly as possible, at the periods in which the seeds or the roots which they are designed to support, are sown or planted in the earth. By the practice of blending the manure with the soil, nearly at the time the crops are put in, there is scarcely any waste of the fertilizing properties of such substances. When the compost heap is in a fit condition to be drawn out upon the crops, I would place the following quantities upon the different qualities of land herein named. The load consisting of a cubic yard

	Strong land.	Sands.	Loams.	Gravels.
Pasture	19	13½	14	15
Clover	18	15	13½	18
Wheat	29	19½	19	21
Turnips	28	21	22	23
Barley	27	22	21	21
Oats	26	16	18	24
Rye	25	23	15	22
Corn	30	31	32	29
Potatoes	32	30	31	33

In the spreading of compost upon the field the usual practice is to put it out first in piles, and afterwards spread it upon the ground. Many farmers cart out their compost during frost, and there leave it in heaps until a thaw. This is no doubt convenient; but if the weather opens the spots upon which it is laid immediately imbibe its juice, and thereby obtain more than their share of the dressing, consequently the crop will of course vegetate more luxuriantly on those places, and the uniformity will necessarily be destroyed. And if the land lies upon declining ground, a large portion of the manure will be washed out by rain, and either be carried to the lowest portion of the field, or find its way to the ditches. Another practice is for both the spreader and carter to stand on the load and shake the manure out with forks, this has the advantage of a more easy distribution, yet if the men drop two forksful where only one is needed, or fail to scatter lumps, they lie where they fall and thus prevent the growth of vegetation. The frequent stoppage of the teams also occupies much time, so that both these modes are attended with inconvenience. When carefully done three teams will be required, if the distance is not great, one to go while the other returns, and the third left with the cart at the yard to be filled and replaced by the one that has returned empty. It should, by all means, be spread at once, as it can never be done at any other time so cheaply, a man may follow the carts and break up the lumps. But if it is determined to lay the manure in heaps the followers should spread it immediately, so that it may assist plants at the commencement of the development of their germs and first radicle fibres. The graminæ, leguminosæ, umbelliferæ, cruciferæ, cichoraceæ, cucurbitaceæ and coniferæ, emit acetic acid during germination, and much more just as the plant leaf breaks through the soil and bursts from the bud, than at any other period of its existence, therefore the manures at this time will be of the most service. Still plants require quantities of the component parts of manures in different stages of their development, thus rye yielded 78-1000ths of ashes five weeks before blossoming, 53-1000ths at the time it was in bloom, and 32-1000ths when the seeds were ripe, consequently it would appear that rye, from the period of its blossoming, restores a portion of its organic constituents to the earth, though the phosphates remain in the rye. The soil receives again from living plants the carbonaceous matter it thus loses, so that certain proportions in it do not decrease.

When the ancients inquired by laborious and tedious researches into the nature of vegetable growth, the results were unsatisfactory to them. Epicurus, Lucretius, Anaximenes and Pythagoras imagined that the air changed into other substances, and they again into air, and that this process went on with a never ending rotation. Tull imagined that the earth supplied the whole nourishment to vegetation. Ingenhousz among the moderns contended for air. Hassenfratz, that carbon was the chief food of plants, and that it was derived from the soil by the roots. Laussure, that plants obtain their earths from the soil. Schrœder, that the earth was derived from vegetation. Grobert mixed four earths, alumina, lime, magnesia and silica, in proper proportions to constitute a rich fertile soil, and supplied the plants which he placed in it with water, but they did not make a particle of growth until he supplied them with a liquid from the barn-yard. Lampadius planted vegetables in one pure earth and supplied them with barn-yard water; they not only grew, but contained by analysis the usual earthy matters, notwithstánding the entire absence of any of them in the soil. Four earths have been found in plants, all the alkalies in the fluid of animals, iron in blood and manganese in hair. None of the earths being simple substances; animals possess the power of forming them during the process of digestion by many unknown combinations and agencies. I once restricted several animals to one kind of food, apples, and the growth of the solid parts of their bodies and the necessary secretions of the fluids went on uninterruptedly, and the animals grew large and fattened. There is no doubt but that charcoal is the only positively fixed ingredient in plants, and notwithstanding it appears to be of great advantage to them when placed around the roots, I am perfectly convinced that it is never elaborated by the plant in that form, as liquids and gases only enter into the combinations in plants. Elastic matters in plants are generated by processes entirely beyond the comprehension of man. And even when we apply solid manures from the compost heap, we have not the most distant idea whether any of them ever pass into the plant to nourish it, or what combinations they form with the earth or atmosphere to improve the growth of the plants ; and we are never destined to know more about it than we now do, unless nature withdraws the veil that enshrouds in darkness the hinges on which this whole matter rests. All the farmer can do is to combine science with practice, and not attempt to influence physical causes and external agencies, without becoming diffidence, which will increase his admiration and reverence for the great creator of all things, who never fails to supply everything created with the required nourishment, in the most regular and harmonious manner, utterly beyond man's finding out.

ASPARAGUS.

Mr. Wm. S. Carpenter advised spring planting, but a great deal depends upon making the bed properly.

STRAWBERRIES.

Mr. Wm. S. Carpenter.—I would recommend the setting out of strawberry plants in spring. I do not consider it good practice to set plants out in July and August.

IRRIGATION OF STRAWBERRIES.

Dr. Trimble asked if any of the members had any experience in irrigating strawberries.

The Chairman.—I heard of a neighbor who has a muck swamp, from which he has taken hundreds of loads of muck; he has dug a deep ditch through it. On this swampy ground he has made a strawberry patch, and I must say that I have never seen a strawberry patch look better than his. This season, while all his neighbors' beds had dried up, he proved this patch was able to supply them all with fruit.

SILESIAN WOOL.

Mr. Jas. Wilson, Masontown, Penn., sends to the Club 20 staples of wool, they are Silesian. I have been engaged in wool growing for thirty years. The specimens were considered very superior.

On motion it was

Resolved, That when we adjourn we adjourn to the 22d of Sept., 1863.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

September 22, 1863.

Mr. Nathan C. Ely in the chair.

CEMENT FLOORING FOR STABLES.

R. L. Beardslee, Warrenham, Penn., says:

"I write you to learn the opinion of the Farmers' Club on the relative expense and durability of cement flooring for cattle stables. I propose fitting up stalls in a shed without flooring, and if cement is preferable I would like to use it."

The opinion of those present appears to be in favor of wood, in preference to any other material. If a cement floor is made of broken stone, grouted with cement, it will be more durable, but more expensive than wood in the first outlay. A very good flooring may be made of gravel, clay, fresh cow droppings and cut straw, thoroughly mixed, and not made soft with water, but beaten hard when laid down, at least a foot deep. Coal cinders are good to mix in the compound for an earth floor.

Sward-Bound Meadows.

Mr. Beardslee also asks whether "sward-bound" meadows would be improved by thorough harrowing, and at what season it should be done?"

This question is easily answered. They would be materially improved, and pastures also. The best time to do the harrowing is when the surface is thawing, after a hard freeze. Grass seed should be sown at the same time. Winter wheat is benefited by harrowing in the spring.

Does the Appearance of the Moon Indicate Wet or Dry?

Mr. N. Smith of Delphi, Ind., gives the opinion of an old farmer upon this subject:

"I have said he is a knock-down argument against the theory that the new moon is any indication of the weather for the ensuing month, as it presents the same appearance to the beholder in Indiana and Kentucky, yet we often have a drouth here, when Kentucky is almost deluged, and vice versa. If I had had any faith in the doctrine before, it would have been entirely dispelled by this view of the subject. As the world once believed that men were 'fools by Heavenly compulsion,' 'thieves, murderers, and scoundrels by spherical predominance,' let us rejoice that these influences are now believed to be confined to plants, and the lower animals, and that only a very limited number believe even this, and that the last lingering absurdity of moon theorists and astrologists will soon die out."

Virginia Cotton and Melons.

Mr. Wm. Bartlett, a Massachusetts Yankee, had a plantation near Big Bethel, York county, Virginia, before the war, from which he was a refugee two years, but moved back last spring, and planted 12 acres of cotton, which bid fair to make a good crop, September 15th, the bolls being then opening, and many of them mature, proving that cotton can be grown in Virginia. In the cotton field, Mr. Bartlett found a volunteer watermelon, which made 1,614 feet in length, and bore 30 melons, most of them large size.

Mr. R. G. Pardee.—This letter is exceedingly interesting, as it assures us that in freed Virginia free labor may produce cotton, and land that is capable of making such a growth of vine is rich enough for any crop, and the riches of that soil we hope to see developed when it falls into the hands of men who know how to develop its resources.

The Patent Cow-Milker.

Mr. Joseph Morrison, Pontiac, Michigan, says: "I have cows that are hard to milk. If the india-rubber cow-milker is not a humbug, but an improvement, I want to know its size, cost, cost of transportation, where and how to get it. Will the Club say a few words about it, and oblige many?"

Mr. Solon Robinson.—I gave my opinion of the cow-milker when it was exhibited here six years ago—that it was not a practical, utilitarian machine; that although cows could be milked with it, it would never be adopted into general use. The correctness of this theory is proved by the fact that it is now so little known that this inquirer don't know where to find it, as it does not appear to be anywhere advertised for sale, and if it was, I should not recommend him to try it.

Mr. George Carpenter said that he would recommend any owner of cows that milked hard to turn them out to fat, and get such as can be milked without a machine.

Dr. Trimble.—I have heard that this patent cow-milker has been discarded wherever tried. It certainly is not in use about here.

Some other gentlemen said that it was sold in England to a considerable extent, but that it is rarely or ever put into practical operation.

Cures for Warts on Teats.

A Western farmer says: "I have found the juice of milk weed, used a few times after milking, quite effectual for the removal of warts on teats. A solution of ammonia cures warts on bipeds, why not on the flesh of other animals ?"

Brigham Pike, Waterford, Caledonia county, Vt., says: "The cure is easy and simple. Take wild turnip that grows in the forest, and steep it strong, and rub it on the wart a few times, and it will become black and soon peel out. If you can procure the green root, cut it open and rub the warts, and that will kill it on teats or hands. It is a sure cure and causes no soreness.

Where to Find Land Under the Homestead Act.

Ives Marks, Big Sandy Post-Office, Jones Co., Nebraska, says one of the most favorable places to make locations is in the north part of Kansas and south part of Nebraska, on the waters of the Republican river and its tributaries; but some of the land is double price by the Railroad Act, for it is selected fifteen miles on each side of the Republican river. On the waters of Big and Little Blue rivers and their tributaries, toward the head of these streams, there is a portion of country from Platte river, in about latitude 42°, and about 100 miles south to the Kansas line, latitude 40°, there is a portion of country very good for settlement, with some timber along the streams, and good bottom and good water, and in digging wells in the bottom one will get water in 20 feet in most all cases, and there are from 10 to 15, but generally 20, and up to 40 and 60 acres of tolerable good timber on a quarter section of land. Some places there is stone suitable for all kinds of farming purposes, and in other, there is no stone. The timber lies along the stream, and is cottonwood, ash, elm, blackberry, blackwalnut, burr oak, honey locust, mulberry and white hickory. This portion of country is about 120 miles north and south and about 50 miles east and west, and the east edge of it is about 100 miles from the Missouri river; there are only scattered settlers, and there is room for a great many more. The price of grain in settlements is reasonable, and the market is very good, being favored with three big roads leading to the Pike's Peak country. One road runs up Little Blue, one up Big Blue, and the other up the Platte river, and these waters coming from the mountain country are very pure, and there is no standing water to make it sickly. The bottoms are very level and don't overflow; fertile and beautifully formed, and will be favored in a short time with branches of railroads from the States, closing on to the Pacific railroad on the hundreth parallel, between the Republican and Platte rivers, and is destined to be the best portion in the country, being right between the gold regions and the main eastern portion of America, and now is your time to get land if you have got none under the Homestead Act, for $12 for a tract of 160 acres. The Platte river is now dry for a hundred miles above the Loup river junction with the Platte; the cause is supposed to be the scarcity of snow in the mountain. The stream is about one-half or three-quarters of a mile wide, and filled up with sand to within two and six feet of the top of the bank.

Ammoniated Guano.

Messrs. J.O. Barker & Co., No. 37 Wall-st., ask our opinion of the ammoniated guano from the islands of the Pacific.

Mr. Solon Robinson—I have used some of this guano upon my farm the present summer, and my farmer, who has been used to Peruvian guano, discovered no difference. That, I think, is a pretty strong recommendation. At any rate, in all cases where phosphates are required, this kind of guano, which costs only half as much as Peruvian, will be found of equal value.

Poison Ivy Cures.

Mr. John J. Tallman, Steadman's, Chautauqua county, N. Y., says: "Whether Mr. Breed, when he speaks of poison ivy, alludes to Rhus Vernix or Rhus Radicous, I do not know; but if the latter, I can fully indorse his mode of preventing persons from being poisoned; and if any person should be so unfortunate as to get poisoned, if he will immediately wash the affected parts in a solution of indigo, or boil up white ash bark in water, and wash in the water, he need not fear any unpleasant consequences."

Caterpillars—How to Get Rid of Them.

Mr. Charles E. Pettit, Munson, Henry county, Ill., says: "Caterpillars are very numerous in this section, doing much damage to our young and thrifty orchards, making nests in the tops of trees. How would it do to take a torch and burn them?"

Mr. Solon Robinson—It will do well. Tie a bunch of cotton or rags upon a long pole, and dip in kerosene oil, and light it and trust it into the nest as soon as it is formed, when the worms are at home and small, and easily killed. Such a torch will burn long enough to destroy a good many nests.

How to Fatten Poultry.

Mr. P. M. Barber, Montgomery Station, Penn.. wants somebody to send answers to the Farmers' Club to the following questions: "In order to fatten poultry most rapidly and economically—1st. How should houses be constructed? 2d. How many should be kept in a house of a specified size? 3d. What should be kept in the house in addition to regular feed to facilitate fatting and also laying? 4th. If any different mode for turkies and chickens, please specify. 5th. Should feed be kept constantly lying in house or should they be fed frequently?"

RIKER'S STRAWBERRIES.

Mr. N. C. Ely, from the committee to examine the strawberry beds of Mr. Riker, at Stamford, Conn., further reports:

The total quantity gathered on the piece of ground 37 feet by 162 feet, up to June 29, was	1,477 pints.
From that date to the 13th of July	639 "
	2,116 "

Being in all one thousand and fifty-eight quarts. I would remark that the variety was the Austin.

ARTIFICIAL FISH-BREEDING.

Stephen H. Ainsworth, West Bloomfield, Ontario county, N. Y., gives the following interesting account of his experiments in fish-breeding. He says: "I have taken a very great interest in the growing of brook trout artificially in ponds on my place. I have tried from seven years old down to last spring's hatching, in three different ponds, keeping the young fry till two years old before I put them into the large pond with the older ones, at which time they are able to take care of themselves. The original stock was put in my large pond, containing 61 square rods of ground, 14 feet deep, supplied from springs, three years ago last spring, 1,400 in number, age then from one to four years old. They weigh now from one to three pounds each. They have been fed daily with liver, and are about as tame as kittens—come at call, and take their food like pigs, throwing themselves clear out of the water in their haste for the food, by the 500 at a time, and even take it out of a spoon six inches above the water. Think of seeing 500 trout, all at the same instant, weighing from one to three pounds, and from twelve to eighteen inches long. The like has never been seen in this country, to my knowledge, before. It will well pay the disciple of Sir Izaak Walton a long journey to see; visitors from hundreds of miles come to see them—ponds and fixtures for breeding and growing. The trout spawns in November, December and January. When on their spawning beds I take them, and exude their ova artificially, and impregnate them with milt from the males, and then place the spawn in troughs, on gravel with pure spring water running over them. They hatch in 78 days, and commence feeding from 40 to 50 days after, during which time they live on the egg attached to them.

Last fall I took in this way about 60,000 eggs, and hatched say 40,000 of them, which are now from two to four inches long. With all things right, nearly all will hatch in this way. These will grow to a pound weight in four years, with good water and plenty of food.

A two-pound trout will furnish about 8,000 spawn; smaller ones less in proportion. They commence spawning when one year old.

In this way they can be increased and grown to any extent, and all the ponds and streams in the country stocked to overflowing.

They can be raised in this way with great profit for market. Price from four to six shillings per pound.

On motion it was resolved, That when we adjourn, we adjourn to the first Thursday in October.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

October 6, 1863.

Mr. Nathan C. Ely in the chair.

Effects of the Borer on Fruit Trees.

The discussion was opened by the Secretary reading a letter from H. Thayer, Blackstone, Mass., in which he attributes the failure to grow choice peaches, as was formerly done in New England, to the effects of the borer, which not only destroys peach, but almost every other kind of fruit trees. He thinks that F. N. Thayer of that place has discovered a perfect remedy for this pest, but does not tell us what it is, but that it is easier and more effectual than digging out the animal, or scalding or applying any kind of wash. "Trees in orchards where the borer was numerous, treated with this remedy, were unmolested, remaining vigorous, while the others were nearly ruined. Well may fruit growers feel encouraged if the operations of this destructive insect can be checked. I am certain this discovery will be effectual and come into universal use." Not unless it is made universally known by a free dispensation of the secret, because so long as it is kept by the discoverer, with an intention of making money out of it, if that is his object, people will be so suspicious of humbug, they will pay no attention to the matter, and will probably disbelieve the statements.

A Cultivated Native Grape of Long Island

Was presented by N. S. Saxton, which although a little odorous of the fox, was considered a very good grape, being very sweet, juicy, and of large size, with a tender red skin. It was pronounced by Wm. R. Prince, the old red grape of the woods, but others thought if it was so, it had been like the Catawba, Isabella, Concord and Hartford Prolific, greatly improved by cultivation, as it is less foxy than wild grapes, and as it is very hardy, where others fail, is worthy of attention.

The Rev. Mr. Weaver presented a specimen of grapes from the garden of Mr. Norten, Jersey City, somewhat resembling the Isabella, though not as large, and those who tasted thought it a decidedly better grape. This Mr. Prince said, was the Troy grape, or, as it is called there, the Hamburg, and probably a seedling Isabella, of which there are several in cultivation, nearly like the original.

Mr. Wm. S. Carpenter stated that he had just visited Charles Downing, at Newburg, N. Y., 60 miles above this city, who has over one hundred sorts of grapes in bearing this year, in his experimental garden. Among those which are very promising at that place, Mr. Carpenter said he would name Morcereau, York Madeira, Miller's Black, Hyde's Eliza, Raabe, Elsinboro, Creveling, all above Isabella and Catawba. The Creveling ripens three weeks earlier than Isabella. The Delaware is in perfection at Newburg. Mr. Mace, whose place is near Mr. Downing's, has 3,000 vines, nearly all young, and expects to sell 18,000 pounds of fruit, which he contracted to sell at 20 cents a pound; the retail price in this city is 40 and 50 cents a pound. Another very valuable grape is Allen's hybrid, which is nearly equal to the sorts usually produced under glass. Perhaps the two best grapes known for out-door culture, are the two new ones produced by Dr. Grant, to be sent out next year from his great propagating houses at Iona, under the name of Israella, named in honor of his wife, and Iona, the name of the Island where he lives. Of another new grape, the Adirondac, Mr. Carpenter is enthusiastic, ranking it above the Delaware.

Mr. John G. Bergen.—I am aware that this grape was rated very high by the Committee of the Fruit Growers' Club, and I thought quite too much so, because it has never been fruited in this vicinity. It may be the best that ever was grown at Plattsburg and vicinity, and a great acquisition for northern culture, but until it has been proved here I think it presumptuous in any committee to give it such unqualified praise, and we should be careful not to recommend it to others until we know its value ourselves. I have a vine of the Adirondac growing which does not show as healthy as other vines in my garden. It has made only two or three feet growth this year, and the leaves have not compared in healthy appearance with Isabella, Catawba, To Kalon, Diana, etc., though the fruit of these rotted—Isabella the least, and under the circumstances of the case, that no one has grown fruit, and that in some places the vines do not grow well, it is indiscreet, to say the least, to recommend an untried variety for general cultivation, and speak of the fruit as superior to the Delaware, which is universally conceded to be one of the best, hardy, native grapes for general culture. ever grown in this country.

It is claimed for the Adirondac, that it ripens where the Isabella will not, and that its growth is equally strong and hardy. That may be a good recommendation for it in Canada, but let us wait and see whether it is so here. It was not so with me this year.

Mr. Carpenter said that he had an Adirondac vine which made seven feet growth this year, and was very healthy.

EVER-BEARING STRAWBERRY.

Mr. Carpenter exhibited a strawberry plant in a pot, in fruit, which is called ever-bearing, and said to be from Australia. It has been continuously bearing ripe berries since the 20th of May.

STEAMING CATTLE FEED.

Solon Robinson.—A correspondent wants some information about "Pappin's Digester." Can any member of the Club satisfy him ?

To this it was replied that it is an English apparatus for steaming food for stock, and is not any way superior to any other steamer, except perhaps in its being portable.

PACIFIC ISLAND GUANO.

Solon Robinson, in answer to some inquiries, said that he did not mean to affirm that the guano known as Pacific, or Baker's Island guano, is equal in value to Peruvian, nor need it be since it costs only half as much; but he does mean to say that it is a valuable fertilizer, and as prepared by the Messrs. Benson's, by adding sufficient ammonia to bring it up to the Peruvian standard, I fail to see why it is not just as valuable.

PLANETARY EFFECTS UPON PLANTS AND ANIMALS.

Mr. Harrison Wight, North Eaton, Lorain county, Ohio, writes as follows:

"I am somewhat amused while reading some letters on the moon's influence on vegetation. My experience in growing crops of any kind for a series of years, demonstrates that it makes no difference whether the moon is new or full, at the time we plant. Generally those who believe in the moon theory, believe also in the signs. The moon's influence on animals and humans is in exact accordance with its right ascension in the heavens, beginning at the head and going to the feet as it passes eastward through the signs of the zodiac. Now I wish to warn all believers in such nonsense, before they wean their calves or babies, before they meddle with their pigs or lambs, to look in the right kind of an almanac for the moon's place or sign, for your pigs and lambs will all die unless you are sure the moon's sign is not at the precise time in the heart. In *Wright's Indian Vegetable Pill Almanac*, calculated by Samuel Hart Wright, of Dundee, Yates county, N. Y., in which planets and pills are all mixed up together, and the sun enters Pisces on the 20th of March, and the moon's place is given among the constellations of stars, for thousands of years ago, when ancient astrologers placed dragons and serpents, goats and bears, up in the heavens, 'twas then the signs and stars were included in the same space in the heavens. But since then by the precession of the equinoxes the stars or constellations have moved forward one whole sign. Now reader, you who believe in the moon theory under consideration, if you look in a large share of the Almanacs of S. H. Wright's calculation, you will find the moon's place one whole sign behind, as given in *Ayer's Cherry Pectoral*. Probably the pills affect the planets and produce upon them a physical effect, and for that reason they are behind their proper place all summer. In *Wright's Pill Almanac* Jupiter is in Virgo all summer, while in *Ayers Cherry Pectoral Almanac* it is in Libra during the same time. What almanac do you generally look to for the moon's place? Do you understand that the moon points and sends his arrows, or vents his spite from the constellation Leo, or from that part of the heavens known by astronomers as the sign Leo, at the heart of babies and calves just weaned? If not, your credulity and the almanacs will deceive you. Will pork shrink or swell when boiling, according as it is well corn-fatted, or as the moon is waning or enlarging at the time of killing, without regard to fattening? One of my neighbors who believes in signs and wonders, (and spirit rappings, too), says if I lay a large flat board over the young growing grass, at the time of new moon in May, the grass so covered will not turn yellow, but stay green all summer; but if you cover it at the time of full moon in May, it will turn yellow and rot in three weeks, and he believes this against the demonstration of experiment. He also believes the earth is flat, and the sun, moon and stars go round, and yet he believes in signs."

"Yours for the cause of truth."

Upon this a spicy debate arose.

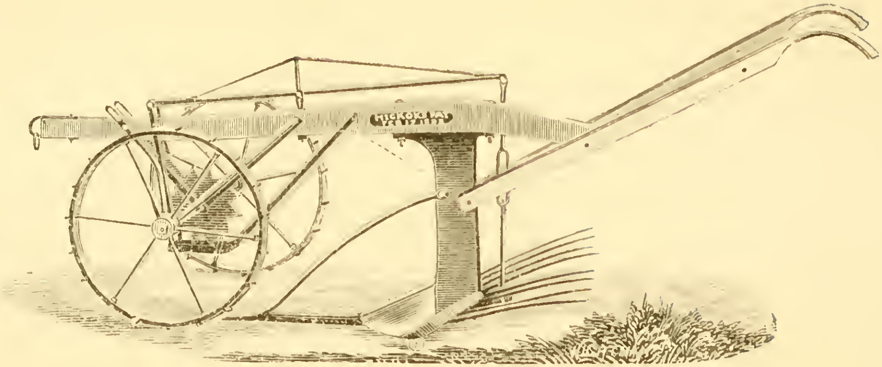
Mr. R. H. Williams, though not exactly prepared to believe all the signs, could not readily give up some of the ideas imbibed in early education about the planetary effects upon the earth. He wanted to know why it was that we invariably see a change in the state of the atmosphere as soon as the sun crosses the equinoctial line, and why it was that we always have a storm at that time, generally followed by frost, and if frost does not come then, it is usually put off another lunar month. At the equinox, he said, we always feel the change of the weather, that summer is gone and autumn come, though summer weather may follow afterward.

Mr. John G. Bergen.—The trouble about this whole matter is, the gentleman assumes things as facts which are not facts. It is all assumption that a change occurs always at the equinoctial period. Although storms do often occur, they are by no means certain to occur at that time, nor does frost always follow; it often precedes and sometimes fails to come near the equinoctial period. We talk about storms and frosts as sure to come at a certain time, as though it was a matter of fact, and not a mere belief that they are governed by planetary influence. I have kept records that prove that frost and the 20th of September have no connection, and that storms are as likely to come two weeks before or two weeks after the equinox as at the precise time. We want facts, and not popular belief about the moon, or influence of any other planet upon the earth.

Mr. S. Robinson.—I do not believe there is any planetary influence upon plants or animals regulated by any fixed law. Just look back only a few days, and think of the so-called equinoctial storm. Did it come at the right time? South of this it came on Thursday, Sept. 17, and here Sept. 18—very mild, but severe in Central New-York; and before the proper time for it, according to theory, it had all passed over, and the weather was delightful until the 25th, when it stormed a little, and again, October 2, pretty severely. Which of these was the regular equinoctial storm, produced by planetary influence, at a certain fixed time?

Mr. John H. Mudget, Forksville, Lake county, Illinois, says: "Some ten or twelve years ago I had a very nice piece of ground I was planting to potatoes; rows about ten rods long; time, in the first half of May; and while in the field at planting, a friend came into the field and said that Mr. Wait always planted on the full of the moon in May, and always had good potatoes. So I covered up what I had dropped, and waited for the moon to full, nearly or quite two weeks. Well, instead of gaining fifty bushels on three bushels of seed, I lost thirteen bushels on thirteen rows, through the piece, which was the part left to plant on the moon. There was still another loss in their inferior size and fairness, though all good. So I have not planted on the moon since. I will let the old man that has made baskets so long on the moon stop and plant his own potatoes, or go without."

Mr. J. G. Bergen.—We cannot entirely disperse the popular errors about the influence of the moon or other planets upon our labors, but, there is an improvement constantly going on. A century ago the moon was much more believed in than it is now, and so was the theory of the equinoctial storms and frosts. Some years we have frosts every month—that was the case this year in Indiana, and in all the Western States there was a desolating frost in August. A brother of mine had a theory that it was never so likely to storm at full moon as at other periods. To prove this or disprove it, we kept records a whole year, and found that more storms occurred at full moon time than at any other time. People seem to be wedded to early prejudices. Let us do what we can to eradicate popular errors. I am aware that a theory once adopted, is hard to get rid of, because people never count any failures. My observations convince me that there are no fixed facts in regard to theory about the weather, and particularly about any certain influence of sun, moon or stars upon the earth. Records disprove many theories.



Hickok's Patent Potato Plow or Digger.

APPEAL TO FARMERS IN BEHALF OF SOLDIERS' ORPHANS.

Mr. Solon Robinson.—Mrs. H. P. Flanagan, Sun Prairie, Dane Co., Wis., sends to the Club the following appeal for the orphans of soldiers:

"Will you permit me to say a few words, not about farming, but to the thousands of farmers and their wives, who read the proceedings of the Club. The winter is approaching—the long, cold winter. To you, in your comfortable farm-houses, with your well-filled barns and cellars, the thought brings no dread, but there are many who shudder at its approach. All over our land may be found families whose main stay has been swept away by the scythe of war now devastating our land—widows and orphans are on every side. I do not write to excite the compassion of our farmers, for I know that they are in general never deaf to the voice of suffering; but, friends, cannot many of you find room in your homes and your hearts for one of these little orphaned ones. To you the added expense will be very small, but to the widow, whose frail hands are her only support, every child is an added burden. Especially is this the case in cities, where every article of food and all the fuel must be purchased, and however bountiful the hand of charity may be, much destitution will be known. I know many will say that the adoption of a child is too serious a responsibility. I acknowledge its importance; still, friends, let us do our part, and trust in the Father of the Fatherless to guide us aright. I write because I believe there are many who will act on the suggestion. I have merely written my thoughts on the subject, as I really think many farmers will do more if their attention is called to it. If you will speak of the matter in some way in the Club, for you know, as well as I how wide-spread is the influence which it wields."

HICKOK'S POTATO PLOW OR DIGGER.

The Secretary—At the late exhibition of the American Institute, Mr. S. S. Hickok exhibited his patent potato plow or digger, the committee appointed to examine agricultural implements reported in favor of the machine, and the Managers awarded to the inventor a bronze medal. The advantages claimed for this instrument are as follows:

First—It separates the row by a curved bar in front of the standard, throwing aside the weeds and vines, and preventing the choking, so annoying in other plows used for the same purpose.

Second—The double mould boards pass under the potatoes without cutting or injuring them, and together with the earth are delivered upon the vibrating prongs, the rapid motion of which thoroughly sifts the earth and leaves the potatoes upon the surface to be gathered up at pleasure

Third—By this process of digging, the surface of the field is left in a comparatively level condition with the soil finely pulverized for sowing grain.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

October 13, 1863.

Mr. Nathan C. Ely in the chair.

THE TRIBUNE STRAWBERRIES.

Mr. H. H. Sherman writes from East Knox, Maine, a letter which shows how the distribution of the Tribune prize strawberry plants is likely to affect the minds of the people, so as to promote improvement in fruit culture.

He says: "We have a plenty of strawberries growing spontaneously upon the farm, and, consequently, I have never taken pains to cultivate this kind of fruit, but I shall take a deep interest in these plants, and if they succeed well in this cold latitude, I shall take pleasure in introducing them to my neighbors There are many other farmers who have "plenty of strawberries growing in the fields"—or rather what they call plenty—and never having known anything of better fruit, which grows four times as large in the garden, where the wife or children could step out and pick as much as the family could eat in a few minutes, have been contented to live on, year after year, upon the fruit of the field, gathered with toil and in insufficient quantity. We trust that the production of these little plants will teach many a lesson, and give impulse to improvement in many a garden. Mr. Sherman says: "If my strawberry plants live and do well, I shall have cause to thank the generous donor as long as I live, and my children after me will associate the name of Horace Greeley with the origin of this valuable accessory to the luxuries of the old homestead, and generations yet unborn shall 'rise up and call you blessed.'" Mr. Sherman asks the following questions:—1st. What kind of soil is most suitable for the plants? 2d. What kind of manure is best adapted to their rapid and healthful growth? 3d. Will it do to plant the several varieties in the same locality, on account of their mixing?

Mr. A. S. Fuller in answer to the above:—1st. "Any moderately rich, deep loam." 2d. "Any rich, well-rotted compost." 3d. "Yes; but it is better to plant them in separate beds. As to the time of planting, there is really no wrong time during the growing season, if the ground is moist and is kept moist, and the plants well shaded if the weather is hot. It is a mooted point whether the best time to plant strawberries is autumn or spring. With care they will succeed well in both seasons—as a general thing, probably best in spring.

Minnesota Sweet Corn.

Mr. Silas Gaskill, Spring Valley, Fillmore county, Minnesota, says that he has a variety of sweet corn far superior to that lately mentioned by our Iowa correspondent, which grows in remarkably small ears, but very early, while this of Mr. Gaskill's grows in ears of twelve inches long, large grains upon a small cob. The seed came from the Patent Office.

Osier Willows.

A correspondent of Campbelltown, N. Y., writes as follows: "I wish to obtain, through the Farmers' Club, information in regard to the culture of the osier willow. I can purchase a quantity of land at a low rate, in which is about twenty acres of very fertile alluvial creek flats. Said flats are dry enough for the cultivation of ordinary crops, but are liable to be submerged at uncertain seasons, sometimes to the depth of two or three feet. I wish to inquire whether or not such soil is suited to the growth of the willow. Will it pay to cultivate it, and what profit? Is there a demand for it in New York, and what prices are paid? How should it be set, cultivated, assorted, and prepared for market? What is the best variety, and where can cuttings be obtained?"

Mr. Solon Robinson—The answer to these questions is, that such soil is very well adapted to the production of osiers, but it has never yet been fully demonstrated whether this crop would be a profitable one in this country. There is a good demand in New York at a higher price per ton than hay ever commands. Perhaps the profitableness of the culture can be estimated from that. As to his other questions, we would refer our correspondent to Dr. Grant of Iona, near Peekskill, N. Y., who is just as competent to give instruction about osier culture as he is about grapes.

The Law of Highway Repairs.

Mr. A. Howell, of Orange county, N. Y., wants to know what the law is regarding the repair of highways as to the source from which the material is procured.

Mr. Solon Robinson.—This question is easily answered. The supervisor has the right to enter upon any man's land to procure any materials necessary to the repair of roads under his charge; but he is bound also to take such as will least damage the owner, and to obtain them from such sources as will be least expensive to the road district, which is bound to pay for all materials used, and all damages done to land. In taking materials from the roadside the Supervisor is bound to do it in such manner as will inflict the least possible damage to the owner of the adjoining land. For instance, he cannot cut a deep ditch opposite to a gateway, nor can he plow up and disfigure the ground in front of a house, unless it is absolutely necessary for the improvement of the road.

Rhubarb Vinegar.

O. H. Kelley, Itasca, Anoka county, Minn., says: "In one of the proceedings of the Club, you state that vinegar can be made of pie plant equal to apple vinegar, by the same process. Do you mean to say that the juice of the pie plant, allowed to stand without the addition of any saccharine matter, will become superior vinegar?"

Mr. Solon Robinson.—No; we do not mean to say that the juice of any plant or fruit destitute of sugar will make good vinegar, because it requires sugar to be changed by combination with malic acid into vinegar, which also contains alcohol. We do say that by the addition of one or two pounds of sugar to a gallon of pie plant juice, exposed to the air, excellent vinegar will result. Several members of the Club having proved this, are willing to recommend all who have pie plant and have not cider, to make their own vinegar.

The Moon's Influence.

Mr. Solon Robinson.—Since the Club opened the discussion upon the influence of the moon upon animals and plants, the question appears to have attracted more attention than almost any other ever debated by the Club. It shows how universal is the belief that the moon does, in some mysterious way, affect the earth. If farmers are really dependent upon the phases of the moon for success in their operations, they should know it. That they may have light upon what most of the members of the Club think one of the relics of the dark ages, we continue to report opinions given by correspondents.

G. B. McGibney, Philips' Creek, N. Y., says: "I have read several interesting articles on the moon theory, which have been considered before your Club. Will some one be kind enough to inform me where these all-important 'signs,' which govern the sowing of grain, the planting of roots, or weaning of animals, originated, and who was the great discoverer? Or is it a fact, as some assure us, that it first came from the fly-leaf of an almanac?"

Why the Moon Affects Plants.

G. W. Stebbins, Portland, N. Y., says: "In the discussion going on through the Farmers' Club, in relation to the influence of the moon on vegetation, I think that luminary is not receiving the credit that is her due. With your leave, I have a little to say in her favor. It is on all hands admitted that light is one of the most important agents concerned in the growth of plants. Then what can be more reasonable than that an exposure to light all night long at certain stages of growth, should be injurious—say, while the plant is young and tender, so much light is too stimulating, while at a more advanced stage it is just what is required. Then, again, moonlight possesses peculiar chemical qualities—how peculiar I do not pretend to know; but certainly reflected light always possesses different qualities from direct light, and has its peculiar office to perform, only inferior to that of direct solar light itself. I believe that planting at the right time of the moon is only less important than that it should be done at the right season of the year. Probably the man who lets his planting lie over a month, waiting for the moon, and thereby throws his crop out of gear with the solar heats, makes a mistake; but that does not prove that it would not be better if he was right with both. I think that we farmers, who, whatever our deficiencies in some respects, claim to be well educated in our own calling, know something about this matter. I think, though less likely to discover something new, we are more likely to be correct in what we do know than you theorists. I think our knowledge partakes something of the certainty of instinct. You doubt our facts, call them old wives' tales, &c., but, nevertheless, I think while the moon stands we shall stand by it."

A Believer in the Moon's Influence.

Mr. J. Cruger, Plymouth Rock, Iowa, writes to the Farmers' Club as follows:

"As you have been pleased to publish a long article in opposition to the moon theory, I would respectfully ask permission to make some explanations. I have not always believed in the moon theory; my faith has grown out of 'careful observations' of certain facts in nature, and an honest effort to trace effects to an appropriate cause. Difficulties attend every new discovery, and not the least of them is the opposition of the incredulous. Your correspondent quotes me largely, yet his remarks are inappropriate to my view of the subject. There is no doubt that the different circumstances attending the cultivation of a crop require a variation in the time of planting; and this accounts for so much difference of opinion. One man plants at the right time for him, succeeds, and believes. Another man plants at the same time, in different soil, under different circumstances altogether, and fails, and pronounces the whole thing a humbug, a superstition, &c. Good soil and good cultivation will generally produce a good crop, if planted at any other time of the moon, but if planted in the best time, would produce a better crop. Perhaps we had better suspend the further discussion of this subject for the present, and wait the results of experiments of the coming season. If they are made fairly, I have no fears for the result. If made with potatoes, there will be the greatest difference in the production in poor soil, or under poor cultivation. (1.)

"And now a few remarks about animals. According to the doctor, there is one animal that, under certain circumstances, may be influenced by the moon. In fact, that doctor who does not know that the sick sometimes may be influenced by the moon 'for better or for worse,' had better go to school again and finish his education. (2.) Almost every one may become sensible of the influence of the moon upon him or herself, if they will carefully watch the change of their feelings with the different phases of the moon. True, they may be slight; they may be interfered with by exciting causes. They will be more perceptible in delicate, nervous, and very sensitive persons, also in retirement, where the person is free from all excitement. (3.) My son returned home the other night singing merrily; one cause, a bright moonlight. (4.) Why do parties choose a bright moonlight night for sleigh-rides? Because they are pleasanter than dark nights.(5)

"Will not some learned astronomer give his views on the subject of the moon's influence, and tell us, if he can, what is the use of the moon, and why we have a moon ?" (6)

Mr. Solon Robinson.—I wish to reply briefly to a few of the statements in this last letter.

1. I will give Mr. Cruger, or any other person a prize of ten dollars, and I think nine other men here will do the same, if he will prove this assertion about potatoes, by actual experiment.

2. No man with education sufficient to fit him for a doctor, in these days of light and science, can believe that a sick person was ever influenced by anything about the moon but its light. If confined in a dungeon he would never be able to tell whether the moon was new or old, unless the notion of its influence was very old.

3. This postulate I deny in toto. It is not susceptible of proof, any more than all the rest of the "signs" and wonders ascribed to this wonderful luminary.

4. Wasn't that singular—that a boy should sing upon a bright, moonlight evening ? Do you think that his vocal powers were enlarged by the size of the moon ? I have heard before of persons being moonstruck, but this appears to be a remarkable case of luno-musico. I hope the case will wane with the moon.

5. This is another extraordinnay piece of testimony to prove the influence of the moon upon animals. It has actually influenced people to go sleigh-riding upon moon-light evenings rather than in dark ones. Oh, thou great moon! In future will I believe in thy influence.

6. Ah, do tell us, if you can, what is the use of the moon, and why we

have it. Why not put it out and make its face as dark as its influence has the minds of mortals? Shall we see any more of the moon?

Adjourned. JOHN W. CHAMBERS, *Secretary*.

October 20, 1863.

Mr. John P. Veeder, of Guilderland, N. Y., in the chair.

NATURAL PRODUCTIONS OF KANSAS.

Mr. R. G. Pardee read a letter from Mr. Beckwith, Olathe, Kansas.

"I want to give to the American Institute Farmer's Club a brief mention of some of the trees and plants of Kansas. Beside oak, hickory, and elm, of each several varieties, we have the black walnut so plentiful that it is used for fuel and fence-rails. On the river bottoms, basswood, sycamore (or buttonwood), and cottonwood, grow to a very large size. Beside the above, the soft maple, hackberry, mulberry, willow, wild cherry and plum, and box elder are quite common, and in some portions the hard maple and pine. From the box elder I have made an excellent quality of sugar, by the same process as is used in the case of the rock maple. We have also the pecan-nut tree, the persimmon, paw paw, and crab apple. Of shrubs and fruits, we find the gooseberry and blackberry very abundant and of excellent quality and size. The dewberry and black raspberry are also quite common. The red waxberry is also very abundant and showy, and so is the hop tree or shrub. But of more importance than any other wild fruit is the grape. Large parties go for miles to gather wild plums, of which there are in some seasons immense quantities, and of very good quality and large size, as large, usually, as the cultivated varieties. But of the grape we have several varieties, ripening in succession from July till frost. Some of these are as large as the Clinton grows in New York, though not quite as large as it grows here, for it is vastly improved from what I knew it to be in New York. The earliest of our wild grapes, which ripens in July, is very small, but is really a grape of very fine flavor. Though I have some eight or ten varieties of cultivated grapes, I am cultivating this wilding, hoping, if nothing more, to make it rival the Zante currant, for which it is frequently substituted. I will mail to you a parcel of the grapes dried, which I wish you to distribute to those who will plant them, as it is not unlikely that the grape may be increased in size, if not in quality, by growing in a cooler climate. It makes a very pungent and aromatic red wine. Kansas is a fine grape-growing country, and at some not very remote day must become justly celebrated for it. The strawberry is also very abundant on the prairies in cool seasons. For the wild flowers of Kansas I must express my especial admiration. Any one here may have a flower-garden of considerable show who will cultivate two square rods of ground with wild flowers. I will name of the many only the following few as deserving of some notice. The blue iris, the yellow day lily, and the purple phlox grow only in the forests, and also the Judas tree and a straw colored honey-suckle. On the prairies we have the yellow cactus, growing only on rocky slopes, the blue and the white larkspur, the latter dotted with purple, growing on moist spots, but only where the grass is very thin. The white evening primrose, a perennial, grows in similar localities, and the yellow, a magnificent flower of from four to six inches diameter, grows on the rocky slopes. The verbena and fox-glove are also very common on rocky situations, not because of the rocks, but because there the deeply-rooted prairie grass will not thrive, and hence there is an opening for any very hardy plant. I have seen two colors of the verbena, red and purple, but the latter has so small a flower, as to be almost unnoticeable. We have also a white hyacinth, a purple petunia, a blue lupin, and many others Sprinkled all over the prairies among the grass we find red and variegated phlox, yellow polyanthus, and sometimes a purple petunia and blue spiderwort, and last of all comes the beautiful blue gentian, with straight-edged petals, after the first frost. All of the above, so far as tried, grow finely under common garden cultivation, and most are equal in beauty to the cultivated varieties. Of wild roses, we have the small prairie rose growing about a foot high, single flower of blush in hot weather, deepening into bright red in cool, usually from two to three inches diameter, and the climbing variety also single, pale red growing in clusters, and resembling in its foliage and growth the cultivated queen of the prairie, and for a single rose is a very fine one."

A Pear for a Name.

Mr. Nathan C. Ely presented a pear for a name, which grew on a tree he found upon his place, at Norwalk, Conn., which is in bearing this year for the first time, and all the fruit presents the uniform appearance of one flat or undeveloped side. Upon tasting, it was pronounced a Duchesse D'Angouleme by Messrs. Carpenter, Bergen, Mapes, Pardee, and others; and Dr. Trimble decided, upon examination, that its malformation was owing to the work of the apple moth. Mr. Ely said that other trees within twenty feet of this produced healthy fruit.

Tree Cotton from Bogota.

Solon Robinson read the following letter, dated Bogota, August 5, 1863, from a gentleman who does not care to have his name mentioned, lest persons might write to him about the matter. Mr. R. said he would vouch for his statement as coming from a trustworthy gentleman. He says:

"I inclose for the Farmers' Club a specimen of the Shrub Cotton about which so many inquiries have been made of late. The specimen is about an average one, and was picked by me near this city, but in a much warmer climate. The plant grows wild all over the tropical regions of New Granada, but is not the same as that of the United States, with which I am well acquainted. I do not believe that it can be acclimated there. It does not grow here where the temperature is never lower than 60 degrees (Fah.) in the house. It is a very beautiful parlor or hot-house plant, and what is a little curious, bears two distinct flowers on the same branch—one a lively saffron and the other a perfect solferino."

Prof. Mapes.—I think the gentleman must be mistaken about the temperature necessary to perfect this cotton, or else it is something different from the true *Gossypium arboretum*, as I am assured that that grows in Chili in a much cooler region; but I have no idea that it can be acclimate n this latitude.

Artificial Trout Breeding.

Mr. Steph. H. Ainsworth, West Bloomfield, New York, a successful trout-breeder, says :

"I would like to see the subject discussed by the Farmers' Club, as there is now a very great and rapidly increasing interest in angling for trout. The forests of the United States are penetrated for them to their utmost depths, and they are decreasing yearly, like the deer, and in time will become extinct, unless prevented by artificial propagation, and protection in private ponds and streams, where they can be increased indefinitely and cheaply.

"I now propose to give you my observation of the formation of the trout in the egg, and its growth from its impregnation to its hatching. I have a race from my main pond running up toward the springs, 50 feet long and 30 inches wide, on an inclined plane, so as to make a gentle current throughout its length; the bottom is covered with washed gravel three inches deep. To give proper depth to the water I raise the water in the pond in the spawning season, which gives one foot of water at the lower end of the race and about four inches at the upper end, with wire screens at each end to shut at will, to hold the trout when they come into the race to spawn as all do with me from the 3d of November to the 12th of January. The females never come on to the beds till the day they commence to spawn, followed by a dozen or more males. At this time the cellular tissue that has held the egg in the ova duct is entirely absorbed, leaving the eggs loose and ready to be exuded with entire safety by hand, and sure of easy impregnation. I close the screen every morning and take all the trout in the race with a small net, sometimes a bushel or more at a time, from four ounces to two pounds each in weight, and put them in baskets in water to have them ready to take in hand. I now take a pail with about four or five inches of water in it, and take a female trout with one hand round the gills and pectoral fins, so as to hold her with ease and safety, and rub down her abdomen, with a gentle pressure, with the other. If all things are right the eggs will flow with the ease and rapidity of shot from a small flask into the water. I continue this gentle rubbing till the eggs are all exuded, which will take a minute or more for a two pound trout. I then quickly place it in the water, and in a short time it will be lively, and soon recover from its handling. A two-pounder has about 3,000, and a one-year-old has about 400 spawn; from five to six of these spawn measure one inch when placed in a line. One side of the egg is always heavier than the other, so that it always, in passing down through the water, alights with the right or same side up. This right side has a very small white speck in its center. Hence this speck is always exactly on the upper side. This speck is where the impregnation takes place. The eggs in the pail being all this side up, and ready to receive the milt or impregnatory fluid, I now take a male trout in like manner, and rub the milt from him by pressing down the abdomen with a heavy pressure, and often squeezing on each side to eject the milt into the pail over the eggs, which spreads out and settles all over them, impregnating them in from five to ten minutes. A two-pound trout will furnish about a table-spoonful of the spermatic fluid of about the color and consistency of milk. This will give a milky hue to the half pail of water, sufficient to impregnate a great number of eggs. This white speck in the egg absorbs an atom of this milt, which at once gives a new hue to its color, changing the egg from a yellow to a clear color. All the trout in the baskets are treated in like manner, and then put back into the pond. The eggs are now placed in clean running spring water of from 38° to 45° at least—the latter degree the best, where they can be examined daily—best in boxes without gravel. The water in my boxes ran down to 38° in the coldest weather last winter. At this temperature, the first appearance of the trout's formation, seen with a magnifying glass, was on the fortieth day, a small red speck on one side of this white spot referred to. This red speck is the commencement of the formation of the heart. In three days more (forty-third day) could see a fine artery extending toward the head to be, and on the forty-fourth day one toward the tail. These arteries extend nearly round the egg, a little one side of its center, from which the head and body of the trout is formed. On the forty-ninth day the eyes were perceptible; on the fifty-first day could see the formation of the head and body, and on the sixtieth day could see the heart beat, and the arteries running from these main arteries all around the head and body in all directions. It now shows life and motion, and continues to grow more perfect in form, and increase in size and motion till the 78th day, when it bursts its covering or outer membrane of the egg, and comes forth a living trout, but very imperfect yet in formation. Having the egg attached to its abdomen, its heart uncovered, and without fins, except the pectorals, which seem to be requisite to breathe. He is now about half an inch long, and were it not for the egg attached to it, would look more like a wiggler we often see in water than a troutlet. On the fifteenth day after hatching, the remainder of its fins are plainly seen. It now takes the motion of the trout, darting through the water, running here and there with great activity. The egg has two membranes or coverings. The trout is formed and grows between them. The arteries run into or through the inner membrane, and absorb the liquid it contains. The trout is formed and lives upon this till it hatches, and continues to live upon it after hatching till it is all absorbed, which takes from forty to sixty days, at which time it is perfect, and commences to eat and look out for itself. It is very shy, and hides at the motion of every moving thing. It is now as wild as the deer, hawk or partridge, but by being placed where it cannot hide, and feeding, it soon becomes tame and eats out of the hand. I think the trout is the most difficult of all other fishes to propagate in the natural way, as they deposit their spawn in the fall, which hatch in the winter or early spring, when the earth and water are frozen, subject to be chilled and destroyed by the water being too cold during the time of incubation; and those that do hatch are very liable to be destroyed by floods the last of the winter and spring, and they are so tender and frail that the least pressure with gravel or sediment will kill them; or even sediment settling on them at any time will destroy the egg. Besides, the parent trout and others that follow will eat all the eggs they can get at the time of spawning, and again in the spring follow up the streams and take all the young fry they can find, so that the chances are hardly one to the hundred to escape destruction. But this can all be obviated by artificial propagation, and all the streams stocked in the country. The increase of a two-pound trout in seven years might be over 7,000,000,000 with perfect success, and all things proportionate."

As to the ease with which young trout can be transported from the propagating ponds to stock natural ponds or streams, Mr. Ainsworth says that he has carried them in ice water twenty miles, but that it is necessary to keep the water in constant motion, as the fish soon die in still water. The impregnated eggs could be transported a long distance in water or clean wet sand, and then hatched and grown in a safe place to a size suitable to put out in natural streams. In this way the whole country could be restocked with these excellent fish, furnishing sport to the angler and food for the people.

Mr. Solon Robinson.—That trout can be artificially produced, with greater profit to the producer than any kind of meat, no member of the Club entertains a doubt. But to induce people to enter upon the business, the subject needs to be constantly agitated.

Prof. Mapes.—There is a trout-pond at Maspeth, L. I., a few miles from the Williamsburgh ferries, owned by Mr. W. H. Furman some three years, that was previously stocked by artificial propagation, and now estimated to contain not less than ten thousand trout. There are a great many places upon Long Island which might be converted into similar food-producing places. The subject of artificial fish-breeding has frequently been discussed in this Club by Mr. R. L. Pell and others, and is one that will bear very frequent discussion to awaken people to its importance.

A New Tea Plant.

Mr. J. P. Veeder, Albany, N. Y., stated to the Club that last summer he was among some bushes that had been cut a day or two, when he thought he detected the odor of tea, and upon looking for what produced it, discovered that it was the leaves of the common sumac. He gathered some of the leaves and cured them as tea leaves are cured, and made a decoction and invited several good judges of tea to taste and give their opinion. They pronounced it a very good quality of China tea, much resembling that known as Oolong.

Dr. Trimble.—I hope this Club won't recommend people to use sumac tea, since it is well known that there are species of this plant which are poisonous. How are common people to know what is meant by common sumac?

Mr. N. C. Ely.—Because a respectable member of the Club states a fact in relation to the use of sumac leaves for tea is why we should notice it, and in doing so the Club does not indorse nor recommend. People generally will understand what is meant by the common sumac.

Mr. Wm. S. Carpenter.—It is that which grows all over this region, particularly in dry, rocky pastures, and bears long cone-shaped clusters of berries, which turn a deep red color in autumn, and remain on the bushes through the winter, and are sometimes used medicinally. The leaves change in autumn to a yellow and scarlet color, which makes it quite a handsome ornamental shrub, for which it is sometimes cultivated, The poison sumac grows in swamps.

Mr. N. C. Ely—Rather in the intermediate ground between high land and swamp, particularly along stone walls, where the soil is rich. The poison variety bears a brown greenish fruit, which never changes to red, and grows larger than the other sort. The kind that I understand is recommended for tea is the same that is used for tanning purposes.

Mr. Wm. S. Carpenter, Mr. N. C. Ely, Dr. Trimble and Mr. Veeder were appointed a committee to investigate the subject, and report to a future meeting.

Mr. Veeder thought it might be profitably cultivated for tanning, since large quantities are imported from Sicily.

Mr. Solon Robinson said that it would not bear cultivation to advantage. A few cuttings will destroy its life.

A gentleman present said that the price of American sumac is generally two-thirds the value of the Sicilian. At present one is $90, the other $60 a ton, ground ready for use. There is no duty on the importation.

HEDGES AND HEDGE PLANTS.

Mr. Martin Allen writes from Mendota, La Salle County, Ill., as follows:

"I notice in your proceedings that you condemn hedges, and, therefore, rather refuse to recommend any plant as suitable for hedging. Now, we of the West are much interested in your discussions. We are also much interested in hedging. Hedges may be impracticable in a country full of timber and stone, where the farms and fields are both small and land dear; but on the western prairies, where land is cheap and many fields contain hundreds and even thousands of acres, and where the material is often brought one or two hundred miles to fence the fields with, I think hedging quite practicable, and I hope your Club will agree with me, and condescend to tell us in their future discussions how we shall best fence our farms, or if not fence in our farms, how to best fence out our roads, which is about the amount of our present fencing. The Osage orange is an excellent hedge plant, but the seed, which is a product of Texas, cannot be obtained at present on account of the unholy slaveholders' rebellion. The West will suffer hundreds of thousands of dollars during the rebellion for want of Osage orange seed alone."

Mr. John G. Bergen—This letter proceeds upon the principle that the Club condemns hedges altogether. This is not so. We have had discussions about what farmers could use for hedging, and some members have insisted that none could be advantageously used.

A very animated discussion followed, in which all sorts of things were recommended, Solon Robinson contending that all in turn had failed, either by drought, blight, insects or hard winters, and that no plant should be recommended for hedging that was liable to fail and leave a man without fence at the most critical moment. Dr. Trimble said that he could not grow a hedge in Newark, N. J., unless he protected it by fence from stock. An arbor vitæ hedge, which some of the members recommend, is browsed by goats and hooked by cows. Mr. Veeder recommended yellow locust, but Mr. Solon Robinson said that that had been extensively destroyed by insects, and so have the various kinds of thorn, and Osage orange and arbor vitæ have both been winter killed. Mr. Veeder said that he had been very successful in growing a screen hedge of white pine, about fifty trees of which, at ten years old, forms an admirable shelter.

A Vermont gentleman said that he had been perfectly successful in forming a live fence out of stakes of various kinds of wood, cut about 5½ feet long, and set 1½ feet in the ground a few inches apart, and fastening them together by weaving in two strands of wire, or by nailing strips on each side. He prefers the wire. He uses stakes from one to three inches diameter, and averages twenty-five to the rod; and if they happen to be crooked, takes care to have all the crooked ones together, and set them so as to match together. He also sets large and small stakes together, so as not to have any weak spots in the line. Perhaps the best wood is the willow, but in wet places the alder has proved excellent. He has used Lombardy poplar, balm of Gilead, lilac and snow-ball bushes. Upon the Connecticut river bottoms he thinks this plan of fencing an excellent one, and thinks it would be on the Western prairies.

Mr. Enos Stevens recommended that willow, balm of Gilead, Normandy poplar, snow ball be planted in rows, say two feet deep; if planted between November and May, they are sure to live and make a stiff fence.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

October 27, 1863.

Mr. Nathan C. Ely in the chair.

GRAPES FOR A NAME—PRUNES.

The first business to-day was the introduction of two sorts of seedling grapes from Mr. David Thompson, Green Island, opposite Albany.

I take the liberty of sending for your inspection a box containing two varieties of grapes, which are seedlings of my own propagation, and raised in my nursery, which is located, at Green Island, Albany county, N.Y.

These vines are as yet unnamed; but I think they are worthy of some Nomenclature. If they are found by you as they have been found by the Albany County Agricultural Society, and by all others who have seen them, will you be kind enough to give them their christening, in order that they may be brought to the notice of the public. I said there was two varieties. I have thirty-three varieties of seedlings, on which I took the premiums at the Albany county fair. I wish to call your attention to these two. The red ones are from vines five years old, and I have found them very prolific bearers. They are rather late; but we think excellent for flavor, and for wine they are not to be surpassed. They are from the seed; and we sometimes think they have a strong relationship to the Catawaba, but I find they do better here than does the Catawaba.

I wish to call your especial attention to the white grapes. Of their flavor I leave you to judge. Many of my clusters will weigh two and a half to three and a half pounds; but in consequence of the wet weather and other causes, a great many of the grapes have fallen from the clusters, as you will observe upon inspection. The white grapes ripen much earlier than the red. The vines are very hardy, good wooded and very short jointed, thereby offering great chance for a great number of clusters. The white grapes are but four year old vines. They were originally raised in a hot house, but the progeny is an out of door child.

I also send you a sample of my Switzer prunes, upon which I received the premiums at the Albany county fair, and a special premium for being the introducer of the fruit into this country. The parent trees, (for I have varieties) were brought here ten years since, and they have borne *very prolifically every year* since, and I have never seen any blight, curculio, insect, black wart or gum on them; the bark is very smooth, and there is no blemish whatever, and their bearing is almost fabulous. These trees must be propagated from the seed and sprouts from the root, and *not by grafts*, for I find that the fruit after a time runs out by partaking flavor from the stock upon which it has been grafted. Of the flavor you must be the judge.

My object is to bring these vines and trees into notoriety, as well as to dispose of the fruits of my labor, and wherever they have been seen, favorable mention has been made, and I have no doubt but that you will kindly make mention and give name to my vines.

Dr. Trimble, who has had the largest experience of any member of the Club in the growing of plums, called the attention of members to the fact that Downing gives no description of any prune under the name of "Switzer." Perhaps it is a mistake of the writer for Quetsche or German prune, though this does not answer that description, nor does the time of ripening agree. Downing says: "The common German prune is described as follows: Branches smooth; fruit long oval, near two inches long, peculiarly swollen on one side, and drawn out toward the stalk; suture distinctly marked; skin purple, with a thick blue bloom; stalk three-fourths of an inch long, slender, slightly inserted; flesh firm, green, sweet and pleasant; separates from the stone, which is flat, very long and a little curved; ripens about the 10th of September. This prune is, perhaps, the most universal and most valuable fruit tree in Germany, Hungary, Saxony and Central Europe. Preserved, it is used in winter as a substitute for butter by the laboring peasantry; and dried, it is a source of large profit in commerce. In this country it is yet but little known, but from the great hardiness and productiveness of the tree, it may be worth trial on a large scale."

There are several varieties of the Quetsche prunes, and this may be one of them. At any rate, it was the unanimous opinion of the Club that is an excellent fruit, and well worthy of recommendation for general culture.

Mr. Carter stated that he saw the trees in September; that they were loaded with fruit, not yet ripe; that they were said to produce such crops every year, and were very thrifty.

Dr. Trimble said that these prunes have been stung by curculio, for here are the marks, but they are able to resist the effect of the stings, and are therefore worthy of attention. I think the melon and pear prunes both better in quality than this, although this is very good and valuable for its late period of ripening.

Mr. G. Pardee—I am free to say that I think this is the best prune I ever tasted.

Mr. Sôlon Robinson—I think we ought to be careful not to recommend anything that is not worthy, but I am willing to give this prune the highest commendation.

After discussion, it was unanimously decided as the opinion of this Club, that the red grape is a well grown and well ripened Catwaba; that the white grape was a sour specimen of the Sweet Water, and that the black grape was a seedling from the Isabella.

How to Grow Plants from Slips.

Mrs. A. B. Collier writes from Tafton, Grand county, Wis.: "I wish to ask the Club, the report of whose proceedings I read weekly with much pleasure, about the propagation of slips from the oleander tree. Where should they be taken from—that is, what part of the tree? and also at what time—whether in bloom or out of bloom? I have tried several ways, but have failed. Also, in regard to the fuschia? Last fall I took off five slips, set them out, and they all died. Now, if you will please give me any information, it will be gratefully received."

Mr. R. G. Pardee.—We must always bear in mind that a high temperature is necessary to grow plants from slips. They will seldom strike roots when the thermometer marks below 60 °, and that is probably why this lady failed, as she says the time was autumn. If slips of the oleander, of the new growth of wood, are set in spring, or very early in the fall, they will probably grow. The best material to start cuttings of any kind in, is clean washed sand. If in the ground, make a hole an inch or two across and fill it with sand. Grape propagators use nothing but sand and water at first. When roots start, the cuttings are changed to other pots filled with rich compost. As to the propagation of English ivy, which another lady inquires about, that is very easy, as it will be found that it throws out rootlets from the vine in creeping up a wall, and if a section of the vine is cut off and set in the ground, these creepers will form roots. There is a magnificent specimen of English ivy upon the stone church in Tenth street, in this city.

Grafting Grape Vines.

This question was pretty thoroughly discussed, as it has been several times before, without settling the question whether it is the best way to propagate vines.

Col. S. D. Harris, of the Ohio Cultivator, who happened to be present, said that he found a very good way to secure the early fruiting of slow growing sorts, like the Delaware, was to graft it, and that the best time to perform the operation was before the full flow of the sap in the spring, or after the full flow has ceased, say in May, and that the scions should be set four inches below the surface of the ground, leaving a small space around the grape, which might be covered with a pane of glass to facilitate the growth of the stock.

Dr. Trimble.—The greatest success I have ever known in grafting grapes was by a man in Pennsylvania who set Delaware grafts in Isabella and Catawaba layered vines, by splitting them with a chisel and inserting the grafts cut in wedge form. It appeared that the stocks sustained the grafts until they struck roots, but that no union took place between the wood of the graft and stock.

Mr. R. S. Williams.—Is there any change in the Delaware grape by grafting it on the Isabella?

Dr. Grant.—There is not.

Mr. R. S. Williams.—This is an important subject, and I hope it will be further discussed. It has been thought by some that both the Isabella and Catawaba are suffering under some form of disease. Now is it advisable to graft a healthy grape upon the roots of such vines.

Col. Harris.—I shall not argue whether this plan of propagating the Delaware vine is the best, but in raising vines from the eyes it is necessary to give them a little bottom heat. Mr. Mottier, near Cincinnati, sacrificed his crop of Delaware's one year by laying down his vines in March for the purpose of making strong layers. Vines that never knew a hot house grow very vigorous.

Adjourned. JOHN W. CHAMBERS, *Secretary*

November 3, 1863.

Mr. Nathan C. Ely in the chair.

Mr. Wm. S. Carpenter—I am pleased to see with us to-day such a number of practical fruit growers, especially those who have made the grape vine their study during the past season. I have changed my views in relation to a character of a number of the new kinds that have been introduced within the last few years. The Concord has exceeded my most sanguine expectations. The Delaware, with me, has borne good crops, and the fruit is increasing in favor with purchasers.

LECTURES ON THE GRAPE.

Mr. H. P. Byram.—It can no longer be doubted that the culture of the vine in the United States is destined to become one of the most important and remunerating of any department of horticulture. The cultivation is now rapidly extending, and yet there is no branch of cultivation in which so much error is dessiminated by horticultural writers as that which relates to the vine, consequently there is none so little understood by cultivators generally. Not one in twenty, hardly one in a hundred, possesses any correct knowledge of the training of the vine in any stage of its progress. Without a correct and thorough understanding upon this point, success cannot be expected. The process is simple, and yet to obtain a correct knowledge of it, one practical lesson from one who is master of the subject is of more value to the beginner than a month's study of the best treatises that have ever been written.

The idea has occurred to me, if the plan could be carried into execution, that would result in great benefit, not only to individuals but to the country at large.

There is no man in the United States who possesses so thorough a knowledge of the culture of the vine as Dr. C. W. Grant.

The plan I propose is this: That Dr. Grant be prevailed upon to give a course of practical lessons at Iona, upon the training of the vine, through all the stages of its growth, from the first to the fourth year, which embraces the whole routine.

I think that Dr. Grant, with his enthusiastic devotion to the culture of the vine, would not refuse to devote one day, specially set apart in a month, or even one day in a week, to practical lessons of this kind when so much public good would be sure to result.

Mr. R. G. Pardee.—I hope some action will be taken on this matter, as I think the subject of great importance to the public; but I think if Dr. Grant could be prevailed upon to deliver a course of lectures before the Club in this room, they would be more fully attended than at Iona. He offered the following resolution:

Resolved, That in view of the increasing importance of the highest culture of the vine to our country at the present time, we do hereby request Dr. C. W. Grant, of Iona, to favor the Club with a series of practical lessons on the culture of the grape vine.—Carried

The Chairman—As Dr. Grant is present, I hope he will consent to give the Club some practical information on the subject.

Dr. C W. Grant.—I understand from Mr. Byram's remarks that his idea is to see the vines in their respective locations; the mode of planting, pruning and training could be seen. Mr. Byram was at my place some time since; he seemed much pleased with the information which he gained.

Mr. P. B. Mead—I deem this subject of great importance to the community, and hope it will be carried out at once, as there is time now to make the necessary preparations for the coming spring.

The chairman then called upon Mr. Mead to make some remarks on the subject of grape culture.

Conditions of Success in Grape Culture.

Mr. P. B. Mead.—I propose to-day to offer some remarks on the conditions of success in grape culture, or at least the leading conditions. During a large part of my life I have given a good deal of time to the study of the vine, having at an early period conceived a deep love for it; indeed, I do not know of but one person who, from a similar motive, has devoted so much time to it. While the people are being rapidly educated to appreciate the value of our best grapes, and cultivators have learned the profits of well-managed vineyards, and are beginning to plant vines in great numbers, very many will be disappointed in their expectations in consequence of not fulfilling the conditions of success. The first and greatest cause of failure is that of using the cheapest and, consequently, poorest vines, which are really expensive in comparison with the best, even in the outlay of money before they can be brought into profitable productiveness, to say nothing of the extensive losses that will occur by the death of the plants. Persons cannot know, until after years of trial, how important it is to obtain the right kind of plants to begin with. It lies at the foundation of success, and with such vines as I shall now show you, full success is more easily attainable than in the cultivation of any other fruit, while with very poor vines it is scarcely attainable at all.

Here are seven grades of vines from single eyes, with very nearly equal intervals of quality, as indicated by their roots and other marks which are clearly apparent to the practiced eye. In describing these grades, I shall make use of the distinctions in common use among nurserymen.

The highest grade are called "Best Selection," which means that they are selected for remarkable value from the class called Extra, which I now exhibit. The primary and secondary roots, covered with their fibers and rootlets like a thick head of hair, seem to leave nothing to be desired; but the one which I now hold in my hand is still better and more mature in its development of the same characteristics that are so satisfactory in the one last shown. This is called Best Selection. These are both grown in large pots, to which they were introduced by a long succession of changes, and they can be produced in no other way. We have here a beautiful combination of primary and secondary roots, starting from a common center, and spreading in all directions, like rays from the sun. These are the best of all vines, but necessarily somewhat expensive, costing not less than one dollar each to produce them, with the most skillful and unremitting attention added. A calculation based upon facts shows that, by the worth of its fruit over a vine like the one marked No. 3, at three years old, the one of Best Selection, at a cost of one dollar, is cheaper *by two dollars* than the one marked No. 3 at fifty cents; and at the fourth season the advantage of the Best Selection will be doubled. This is not an exaggerated instance, but a fair representation of every day occurrence. I would repeat the assertion that I am often compelled to make, that the best are emphatically the cheapest, as fully demonstrated by innumerable trials.

[The reader will understand that Mr. Mead exhibited specimens of the different kinds and grades as he was speaking.]

Here are the same grades that were begun in pots and finished in the open ground, that have nearly the same value, the roots being larger, and the vines also, but not so hard and fibrous. They had attained a good size in pots before being put out, and have all of the advantage of the transplanted vines of two years, with the additional advantage of carrying more of their excellence of constitution into immediate effectiveness than is possible with the vines of two years, when planted in place to fruit.

Here are No. 1 vines for vineyard planting of excellent quality, and such as will not cause disappointment; and here are No. 2 and No. 3. All of these are excellent vines, and bespeak a good measure of success speedily, but each grade removes the period of bearing about one year, and when nearing the lower grades supposes a degree of attention by the cultivator which they are not likely to receive. Here are No. 4 and 5, which are still much better than very many that are sold for the best vines, and good vineyards may be made from them; but there is no need of repeating what I have said in regard to the economy of the best vines. Here are vines two years old transplanted and root-pruned, and here are vines that have been well treated to the time of their establishment in bearing at four years old. I will now prepare all of them for planting by proper pruning.

Now these are all in proper condition for planting ; and although the one four years old may give some imperfect fruit the first season, it does not take so much of the effective apparatus of the vine with it into the ground at transplanting as those called Extra, Best Selection, and No. 1 Transplanted; and at three years from planting it will be greatly below any of the three in the value of its produce.

It is time that this wrong idea of the increase of the value of vines by age was entirely got rid of, for it is constantly leading to the most serious disappointments, and at great expense. All vines, to be valuable and give good permanent results, must, whatever may be their age, be brought to the condition of one year old vines, for it is only the roots and wood of one season that are of any value for transplanting.

The simple statement that a vine is two years old, and has been transplanted, although it gives an important circumstance concerning it, does not fully specify its value. A vine that is pretty small at one year old, if it has maintained its health through the entire season, may be made to become a pretty good plant at the end of the second, by transplanting and root-pruning, if it receives besides the large amount of care that is required.

Without transplanting and root-pruning it will become a much larger vine, and more attractive to some people, who do not know how to estimate its quality ; but the fibrous, or secondary roots, near its center, upon which the value of the plant chiefly depends, will be lost, and with it nearly one year of time, at least.

By those who are unacquainted with the important characteristics of vines, the one not transplanted would be preferred from its greater size ; but the practiced horticulturist or vineyardist, who has learned to judge of the vines by their ability to produce in the garden or vineyard, will not hesitate a moment in choosing the one which has its secondary roots where they can be available, rather than at the extremities of the two-year old roots, where they are all lost by the necessary cutting back at planting.

In this way many tolerable vines of two years old, transplanted and root-pruned, are made like those that I now exhibit.

But the *best* vines, two years old, transplanted and root-pruned, can only be produced from the best one year old single-eye plants, like the one I now show, by pruning it to the form which it now presents, [showing it with the roots cut back to about eight inches in length, and the cane cut to three eyes.] From the ends of each of these roots generally three new ones will be produced (not certain in number—from two to five), and along the entire length of the remainder of the root that has been cut back permanent secondary roots will be produced, occupying the ground fully, and making the vine robust and fruitful.

I have said that the vines which have been shown as single-eye plants, best selection, are the best plants with naked roots (naked in contradisdistinction from those grown in lattice boxes, or baskets, and moved with a sufficiency of the soil in which they were grown) that can be produced. I must qualify the assertion slightly. The plants of best selection, treated as we have just shown, are equal in all respects to the single-eyes, and can better endure the trials of the first season, without injury, especially where the ground is not in the most perfect state of preparation, from having been recently done, or where the attendance is not at all times as careful as it should be. For myself, I could ask nothing better, for extensive planting, than the single eye, best selection, which I now exhibit. For the large majority of persons who treat their vines pretty well, this of best selection, transplanted, is preferable.

I will now show you one of four years old, that has been taken up for sale, and it is a pity, too, that it has been taken up. It is a fine Delaware, and the crop of next season, which it is abundantly able to bear, would have brought more than the price now asked for the vine. Let us now prune it for planting. In the first place, cut one of its large canes entirely away, and then cut the other to three eyes, but one of which must be permitted to grow. Only the new root that has sprung from near the surface can be retained: all of the rest must be cut off, for it will continue dying for two or three years, until it has all disappeared, and the vine becomes a new plant; so it had better be done thus at once, as all experience teaches. Now you see the three vines, of three different ages, all reduced to the condition of one year old vines for planting. While you are looking at them, I think it may be seen that most of you, with your present light upon the subject, would take the transplanted of two years first, and that of four years last. You would be right; but I will state the case for you a little differently. For the experienced gardener, whose attentions are always bestowed at the right moment, the best selection of one year; for the attentive amateur, the transplanted best selection; and for the man who cares nothing about the matter, the vine of four years old. But the time is near when there will be few careless horticulturists, and when good vines, well attended, will be an essential part of every homestead; not to furnish a supply of a score, or a few scores of pounds, to last only a few days, but hundreds of pounds, for at least six months of the year.

The wish to obtain, as speedily as possible, fruit so beneficial and excellent as that of the grape, is so commendable, that I am laboring to encourage rather than to repress it; and I desire, moreover, to put every one in the true way to obtain it abundantly, cheaply, of best quality, and as speedily as possible.

For general planting, the purchaser of the best plants, from single eyes, never does wrong.

But there are other kinds of plants, of one year old, that will yield fruit sooner, and some of them immediately—that is, the season of planting.

The vine which I now exhibit is called a Layer, and is a good representative of the best quality of that kind of plant. This, you will observe, has two strong canes of bearing wood, each at least eight feet long. If these had not been disturbed, but suffered to remain in the ground where they grew, they might have been pruned to two feet each, and suffered to bear from six to twelve pounds of grapes the next season. In consequence of being taken from the soil, for removal to another place, their ability to bear will be greatly lessened, so that even four pounds would be a pretty large amount for such a vine to bear the first season after transplanting.

It is only the best of layers, that are skillfully produced from strong healthy mother-vines, prepared for the purpose, that will do this. Ordinary layers will not. Such plants are necessarily expensive. Inferior layers are the poorest of plants, and should be avoided. I will not now attempt to describe the manner of producing good layers, but leave the subject for the present, simply saying that very few of them are produced. This one, with abundance of secondary or fibrous root, evenly distributed, is a model plant of its kind. That with long primary roots and straggling, detached secondary roots, is to be avoided.

I have here something that is new to nearly every one of you. Very few of these have been produced in this country, and none for sale until last season. In speaking of the last I mentioned that its ability to bear was greatly lessened by its being moved from the ground. To avoid that check this one has been grown in a lattice box or crate, so that a sufficiency of soil may be moved with it without being disturbed. This, you will see, by the size of the canes, and by the number, appearance and equal distribution of its secondary roots, protruding on all sides from the box, is a layer of best quality. It is called a "box layer," or a "covered layer," in distinction from one taken from the soil like that previously shown, which is called a "nude" layer. Vines like this receive but little check by transplanting and transportation, and yield fruit the first season. Such vines will cover a trellis with their beautiful shade the first season, and give at once the air of complete establishment, instead of raw newness, which detracts largely from the enjoyment of new places.

This vine is a present to me, and I need not say that I prize it highly. It is the Iona.

In answer to the question, as to whether vines from single eyes are better than those from cuttings, the lecturer stated that they were, and that the superiority was easily demonstrable to the understanding of cultivators, but would occupy too much time for the present. A vineyard from the best single eyes would give better results at four years from planting than one from cuttings at six or seven.

The propagation of hardy vines from single eyes for the open ground is an Americanism, and the feasibility and great advantage of it, in a large way, were first demonstrated at Iona Island.

In answer to the question, Are not hardy vines made tender by being propagated under glass? the lecturer said, by no means; but, on the contrary, with the proper appliances, the skillful propagator is thus enabled to command all of the conditions of success, which, in proper hands, result in the production of perfect plants, such as I now exhibit to you.

Observe, not merely the quantity of roots, primary and secondary, with their innumerable rootlets, like a thick head of hair, but their uniform distribution, with their wiry hardness and strength. Try the solidity of the wood by cutting with a sharp knife, and its weight by seeing it sink in water; note the smallness of the pith, the fullness of the buds, the nearness of the joints, and the ripeness of the wood, even to the extremity.

The great superiority of such plants has been too often demonstrated by trial to leave any doubt in the mind of the most skeptical. They are not forced, but judiciously treated for the benefit of purchasers.

I must be careful not to be misunderstood in regard to the production of vines under glass. I would not have it inferred that, because the best vines may be produced under glass, and by the aid of houses, none but the best are so produced. The very poorest have been so produced, and, doubtless, will continue to be, if the call of purchasers is for very cheap rather than for very good vines. The conditions of goodness and cheapness are in direct opposition, and purchasers will control the matter.

The art of propagation, when skillfully practiced, is one of exceeding nicety, and requires fine perceptive powers, thoroughly trained.

Many vineyards have been planted with vines below Nos. 4 and 5, which I now exhibit. Good vineyards may be made of all these grades, but to the best cultivator in the world who buys the vines it will cost more to make a vineyard of the inferior grades than of the higher, and the vineyard can not be so good of the former as of the latter, and much time will be lost. I did not intend to estimate the difference in value between vines of moderate and those of excellent quality. A part of the difference will be one year later in bearing. This amounts to the net value of the crop for one year after full establishment in bearing, added to the cost of attendance and interest of the investment one year. If we put the sum at one dollar, it will be too low. This presents the case fairly, and in its true aspect.

But comparatively few who plant vineyards are of the very best class of cultivators, and to these the difference will be greater. For such to buy the lower grades of vines would be a mistaken effort at economy.

It is only good vineyards that are both pleasant and profitable, and such I desire to see.

An excellent vineyard of one acre of the best varieties may be looked to confidently for a more valuable crop than the average of four acres of cheap vines, in ground moderately prepared and rather negligently attended. One acre of first rate vineyard is a handsome and valuable possession. A trellis of one hundred vines, in the best condition, will furnish more enjoyment for a family than can be obtained from an equal expenditure of means and attention in any other way.

The best Delaware grapes have brought, the past season, sixty cents a pound. For years they may be expected to range from twenty to fifty cents a pound, according to quality. The best may be expected to command fifty cents. One half the produce of the trellis would afford a tolerable family supply, and the sale of the other half would pay for the entire attention of a well kept garden.

If those who desire to obtain vines will acquire the information which they should have, in order to enter upon the course understandingly and safely, producers of vines will, by force of circumstances, be compelled to furnish good ones, for they will find sale for no others. My object in this lecture is chiefly to furnish such information; and if I could speak to all who are about to obtain vines, and could demonstrate the true course of proceeding, by the exhibition of the realities of the case, as has just been done, few that are capable of comprehending any subject fully would go wrong in this.

The production of good plants is the first step toward obtaining grapes, and the second, obtaining good vines in perfect order; but these steps, however well taken, are not, of themselves, sufficient to secure the accomplishment of the largest success.

After the vines have been obtained, two other steps, of equal importance, are to be made before the goal can be reached; the first of which is, the proper planting of the vines in suitably prepared soil; and the next is proper cultivation and training.

When these operations are unskillfully performed, the best plants often prove to be but little better than the poorest in their results, which is utter failure.

Adjourned. John W. Chambers, *Secretary*.

November 10, 1863.

Mr. Nathan C. Ely in the chair.

Seeds from California.

The Secretary read a letter from Mr. John Bruce, of Mariposa, Cal.:

"I have been successful in obtaining, through the kindness of Mr. Galen Clark, some rare seeds and gums from the trees whereon the seeds grew. Mr. Clark had an order from San Francisco for seeds of the mammoth tree, *Washingtonia Gigantea*, to obtain which he had to cut one of them down, there being no other mode available from their immense height but at that sacrifice. From the tree he cut down he obtained sixteen pounds of seed, this to me, at first, appeared but a small recompense for such an amount of labor. The seeds themselves are so minute and light to be the product of such immense giants, and the burs containing them must of themselves, when in the green state, be of great weight. I obtained four of the burs in the green state, containing the seeds that were quite heavy for their size. These I now send you, together with a small quantity of the seeds taken from the burs for distribution. I also send you some seeds of the Sugar Pine, a magnificent tree of from 250 to 300 feet high, and ranging from 15 feet to 5 in diameter. I also send some of the gum contained in the mammoth trees, which, it is supposed here, is the cause of the longevity of the trees and the durability of the wood, after the tree has fallen, for it is a truth, that all the prostrate trees show no visible signs of decay, though there is abundant evidence to prove that some have lain prostrate for thousands of years. I am particularly desirous, with many others here, that the gum from the mammoth trees should be submitted to the chemists of the Polytechnic Club for analization. I was in hope, at this time, to have sent you some of the seeds of the mammoth cedar trees, little inferior in size to the sugar pine, but as soon as I can obtain I will send them. If those obtaining the seeds of those splendid trees succeed in their culture, future generations will have cause to bless them for the deed."

Prof. Mapes moved that the thanks of the Club be presented to Mr. Bruce, for various seeds sent by him, viz: Mammoth Pine, Sugar Pine, Wild Perpetual Flax, Chinese beans, bearing pods three feet in length, Mexican Holyock and Belle of the Night. Adopted.

CHANDLERS' GREAVES FOR MANURE.

Mr. Nathan Leeds, Cinaminson, N. J., asks: "What is the best method of preparing chandlers' greaves for manure?"

Mr. Solon Robinson—If broken fine, they may be used like guano. If you have muck, mix one load of greaves with fifteen of muck, adding a sprinkling of lime and salt to each layer as the compost pile is made. When the pile gets quite warm, turn and air it. The greaves may be advantageously fed to store hogs and poultry, and their value saved in the manure.

Prof. Mapes.—Chandlers' greaves make a very strong manure; too strong to use in a raw state, because they would be likely to generate so much hydrogen gas in the soil, during decomposition, that it would injure the crops, as grubs always abound in such a condition of the earth. I would soak the greaves soft, so as to separate all the atoms, and then mix with muck, which would be all the better if treated with the salt and lime mixture, so often recommended. If muck is not to be had, substitute leaf mold, rotten sods, or rich loam. The greaves should never be mixed with stable manure, because that is already sufficiently nitrogenous.

BRINE FOR MANURE.

Mr. J. Z. Gordon writes from West Newbury, Mass., for the opinion of the Club about the best way to use old brine for manure. He says: "My practice has been to pour it upon the barn-yard manure in my barn-cellar. Is this right or wrong?"

Mr. Solon Robinson.—It is altogether wrong. It would be more serviceable upon a compost heap. If largely diluted and sprinkled upon grass, or almost any other crop, immediate benefit would be obtained. There is no upland in Massachusetts that would not be benefited by salt. We have used it for three years to the amount of 15 to 20 bushels an acre, and never purchased any manure that paid so great a profit.

Prof. Mapes.—It is not serviceable to stable manure to pickle it. The best way to use brine is to add more salt to bring it to the point of saturation, and then use the brine to slack lime, to make a crude chloride of lime to use in decomposing muck. As to the use of salt on land, it is, up to a certain point not likely to be reached, always beneficial. It is considered so much so in England that provision has been made to pass it toll free upon some roads. In Hunterdon county, N. J., some of the farmers put an excess of lime upon their land, so as to render it partially unproductive. A dressing of salt restored the fertility and made the soil better than ever before. I used salt to such an extent upon fence row bushes as not only to kill them, but to stop the growth of all grass and weeds for one year. A dressing of lime restored fertility and made the land very productive.

Cultivation of Madder.

Mr. Jasper Manlove, Shawnee Mound, Tippecanoe county, Ind., wants information about growing madder as a crop, as he thinks the soil of that part of Indiana suitable.

Mr. Solon Robinson.—Who has had experience enough to give him and others trustworthy information? We think, as a general thing, growing madder has not been successful in this country.

Prof. Mapes.—A Mr. Naught, a few years ago, wrote a very interesting account, in The Working Farmer, of his experiment in trying to grow madder in New Jersey. It was valuable, because it was the detail of a complete failure. I believe all attempts to grow madder in this country have failed.

Value of Corn Stalks for Forage.

Mr. J. C. Collins, New Albany, Ind., asks the Club to tell him "the cheapest and best way of preparing corn stalks for forage for horses and colts, and what value does it bear to timothy hay, pound for pound?"

Mr. Solon Robinson.—The best way is to feed the stalks whole, because they are not healthy food for horses when cut. The sharp edges of the stalk are dangerous if swallowed, as they sometimes are by colts, without being fully masticated. We should estimate the value of clean top stalks at more than half that of timothy hay.

Mr. Wm. S. Carpenter.—I have had a good deal of experience in feeding both cattle and horses with corn stalks. I have a machine that not only cuts them fine, but breaks, splits and crushes the pieces between corrugated iron rollers. With one horse-power I can cut a ton per hour; and thus treated, I consider it almost as valuable as timothy hay.

Prof. Mapes.—I would not only chaff the stalks by passing them between rollers as described, but soak them soft in water or steam, adding meal to make them more palatable to stock. If fed dry, when cut in long pieces, they are certainly injurious.

Early Samaritan Potatoes.

Information is wanted of the value of this new variety, or else old variety with a new name. The answer to this question, given by several members, is that the potato advertised under this name is an old variety, and the attempt to sell it as a new one is a cheat. Mr. Carpenter said that he had tested the potatoe called Early Samaritan, and finds it possesses no advantages whatever.

Sleeplessness in Moonlight.

Mrs. Sarah R. Ferris, Ionia, Mich., says she is satisfied by experiment that sleeplessness in moonlight is all occasioned by the light, and not by any other influence of the moon. Of its influence upon plants, she also proved, by sowing radishes at all ages of the moon, that it was not necessary to sow the seed at the full, notwithstanding everybody said it must be done. She says: "This experiment convinced my children that planting seeds in the moon is humbug."

CULTIVATION OF SUNFLOWERS.

Mrs. Ferris also urges the Club to recommend the cultivation of sunflowers, because their growth, it is thought, absorbs miasma and prevents chills and fevers. She says: "We have for several years past raised a great many on that account. We also find the birds are very fond of the seeds. I have seen at one time thirteen winter birds on one stalk. 'Tis very pleasant to know we have raised something to feed the dear little creatures in the cold weather, and call them around our homes. They chirp and sing so sweetly. Sunflower seeds make excellent food for chickens, and the flower is easily and cheaply grown."

HOW TO DESTROY FOUL SEEDS IN MANURE.

Mr. E. D. Wright, Pierpont, Ashtabula county, Ohio, wants the Club to discuss the question how to destroy foul seed in manure, as he thinks it one of the most important questions that a farmer can consider.

Mr. Solon Robinson—It is truly so; as it is more profitable to grow grass, cereals or roots than it is weeds. The only way to destroy such seeds is a hot, fermenting compost of the manure, which would lessen its value, and which would not always effect the purpose. We have come to the conclusion that the only way to get rid of such seed is not to ripen it. Of course this requires eternal vigilance.

Prof. Mapes—Whether it will lessen the value or not, there is certainly no other way to destroy foul seeds in manure than the process of composting.

SILKWEED.

Levi Pounall, Lancaster county, Penn., sends "a pod and cotton of a stalk that has grown for ten years among some bushes," though he has never seen its fruit until this year, and he asks: "Is the cotton of any value."

Mr. Solon Robinson.—It is evident that the common milkweed (*Asclepias*), that has grown for ages all over New England, is not common in that part of Pennsylvania, or else it would be no curiosity to the writer, and he would have learned before now that the fiber has no practical value, or at least not enough to make the plant a valuable crop, though it has been thought the juice might make it so, use d ithe same way as gutta percha.

Prof. Mapes—A gentleman has furnished me with a specimen of a plant which may be one of the Asclepias family, which grows stalks four or five feet high, three-eighths of an inch in diameter, which are covered with a thick, fibrous coat, much stronger than hemp; and if they will bear cultivation as well as hemp, their appearance indicates that they will produce a very profitable crop, as the fiber is soft, and the woody part of the stalk easily separated by any machinery that will break flax or hemp.

THE VALUE OF GRASS—THE FAILURE OF NEW ENGLAND PASTURES.

Mr. Ward Cotton, Hartland, Vt., writes upon this subject as follows: "As I have taken deep and abiding interest in the discussions in the

Club, I wish to bring to their notice a subject of vast importance to New England and Northern States. I consider the grass crop in that portion far exceeds in importance all other crops.

"It is a fact that, in the last half century, our pastures have deteriorated to an alarming extent. For instance, through all the States of New Hampshire and Vermont, or the old parts, one acre in 1800 would keep as much as five or six in 1860. The question I wish to have considered is: How is this exhaustion to be arrested, and the original fertility restored? for if it go on, we shall be obliged to pack up our traps and find pasturage elsewhere. It will be said, and with some truth, that our hills were exhausted by raising rye for distillation. It is also true that there is but a trifling difference between those lands and those which have never felt the plow; both, where sixty years ago were covered with red and white clover and herds grass, are now grown to white grass, sweet fern and daisies on the high lands, and on the low lands, brakes, polypod, mouse ear, and a thousand and one other weeds without any name.

"Perhaps it will be said the low lands should be underdrained, but that is by far too expensive for pasture land, and the hillsides must be plowed and manured, but we can obtain manure from all sources in quantities only for hay and plow fields. Besides, a large share of New England pastures are not suitable for cultivation, on account of steepness and being rocky. The idea has all along obtained that pastures would not deteriorate, but a moment's thought, aside from experience, would show the fallacy of that theory. When we consider how much of bone, meat, tallow, horns and hide, added to milk, butter, cheese, &c., is taken off, and how little is returned, and that little exposed to atmospheric influences and the washing off of the finest portion by violent showers into the plains below, we cease to wonder at the exhausting process. And where is this mighty consumption going on? In the cities and large towns mainly, where little or nothing is ever returned. For instance, the city of New York consumes nearly three times as much as the State of Vermont, and nothing is returned to the pastures whence it is taken. I have read in the Massachusetts papers that the quality in the soil which made the bone were being extracted, so that many of their cattle were destitute of good and healthy bone; but I do not exactly take stock in that theory, as the results would be too fearful to contemplate, for, if that be true, then why might not the property which constitutes the hair, skin, muscle, wool, &c., be lost, and finally affect the human system? But as such results have not been experienced in old countries during thousands of years, I know not why we should look for them here. It may be interesting, in order to give an idea of the inevitable power of exhaustion, to contemplate what becomes of the products of the soil, and certain it is that they nearly all finally enter the stomach of man.

"Of the grass, hay, grain, vegetables, animals (except horses, and a few which die of disease), millions of insects devoured by poultry and game, together with what is drawn from the ocean and its tributaries, all contribute to the sustenance of man. And where is this mighty army of consumers? They are encamped in great cities all along the borders of lakes and rivers, so that the producing country receives a mere trifle in return for all this vast drain.

"In addition to this there is a large portion of country not content with the usual method of consumption, but converts the various materials into drink, in which a full grown toper will consume nearly one bushel of grain per day, and, after all this vast consumption, the inhabitants of the earth have generally found enough for their use, and all this comes from grass, so that it is almost literally true that, "all flesh is grass." However, I wish to call the attention of the Club to the all-important subject of the preservation of grass.

Mr. Solon Robinson.—Mr. Jefferson said, nearly a century ago, that cities were as cancers on the human system; but I suppose he meant in a moral point of view, but it seems evident that the same is true physically.

Caterpillars—How to Kill.

Mr. B. G. Watkins, Montrose, Pa., says: "I tried burning caterpillars, and injured my trees. Now I take the pole and swab, and pail of strong lye, and soak the nest; push the pole and swab through the nest; twist it around, and down will come the nest, and it will kill the worm as quickly as the burning, and the lye will benefit the tree."

Prof. Mapes.—If burning fluid is used to saturate the swab, the flame will not injure the limbs, yet will be strong enough to destroy the nest. I have tried lye, and it does not kill caterpillars.

A Cherry Tree Pest.

Mrs. H. Fry, Ludlow, Vt., speaks thus of a new pest: "It has a slimy appearance and nauseous smell, and feeds upon the leaves of the pear and cherry trees from the lower branches to the top, from early summer till fall. It is half or three-fourths of an inch long—color black—with a large head, larger than any other part of the body, tapering, and moves but little. Some appear quite large, others very small. I went around every tree in the summer and pinched up every leaf that these worms were on; but it was not long before I perceived another crop. Where they come from I do not know. All the cherry trees that I have examined in this vicinity are affected in the same way, maybe not as badly. If you can give the necessary information how to rid oneself of these plagues probably many would be thankful."

Dr. Trimble.—The description of this insect indicates that it is the common slug, which is so destructive to our rosebushes. I know of no effectual way to destroy it but the one practiced by the lady, that is, pinching its head.

Mr. E. Williams, of New Jersey, recommended sprinkling the trees with powdered lime, which Dr. Trimble said would not injure the trees, nor insects neither.

A Bee-Moth Trap.

Mr. John Nicholas writes from Meadville, Crawford county, Pa., that one of his neighbors has invented a moth-trap, which is effectual. It is simply a box, with a movable top, and frames which hold pieces of comb, convenient to remove for examination and destruction of the moth, which enters through holes, and deposits its eggs in the comb. This box is placed by the side of the hive, and furnishes a perfect hiding-place for the moths, where the bees do not molest them, and where they can be destroyed. The theory is that the moth will not attempt to enter the hive while it can find a much better place in the box.

Several of the members who spoke upon this subject recommended Steele's moth trap, which effectually keeps out the moth, the holes into the hive being closed with little tin doors, which the bees can and moths cannot open.

A List of Grapes—Cultivation of Grapes.

Mr. Solon Robinson read a letter asking a variety of questions about grapes, which were answered by Mr. Peter B. Mead. For a list of 26 vines to be grown for family use, he names the following: Delaware, 8; Iona, 5; Israella, 2; Diana, 2; Anna, 2; Union Village, 1; Allen's Hybrid, 2; Rebecca, 1; Elsingburg, 1; Lincoln, 1; Herbemont, 1.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

November 17, 1863.

Dr. Hawks in the chair.

Sorgo Syrup.

Mr. David Whitson and Mr. Nicholas Haight showed a sample of 1,430 gallons of Sorgo syrup, made near Madison, Wisconsin, in latitude 43 degrees, at the rate of 160 gallons per acre. No clarifying agents were used; yet this is clear, and almost as nice for table use as first-rate strained honey, and would be worth to-day in this market $1 a gallon, since Porto Rico molasses is worth 70 cents a gallon by the cargo. For ordinary use, this syrup would need no refining. Belcher Brothers have a large refining establishment at Chicago.

The Sumac Plant Described.

Mr. Solon Robinson read the following letter from Mr. John Groves, Poughkeepsie, New York :

"The new tea plant so favorably spoken of at the American Institute Farmers' Club, if really an efficient substitute for the China Oolong Tea, would be of most essential service to poor persons in the rural districts, independent of any other consideration connected with it, but the plant is evidently not well understood even by professional men. In such cases it is, perhaps, the best method to collect together the best authorities on the subject. In Miller's Botanicum Officinale, published in London in 1722, and dedicated to the celebrated Sir H. Sloane, Bart., M. D., I find the following description :

"'*Rhus Coriaria, Currier's Sumac.*—This Rhus grows not to be a tree of any great magnitude, having its branches clothed with long, pinnated, rough leaves, whose single pinnæ resemble the leaves of the elm tree, but are somewhat longer. The flowers grow in large white clusters, which are succeeded by small, flat, round, hairy seed, of a restringent earthy taste; it grows in Italy, Spain and Turkey. The leaves and seed are used. They are both very restringent and stiptic, both used inwardly and outwardly; they resist putrefaction, and stop gangrene and mortifications.'

In Rennie's Supplement to the Pharmacopeias, London, 1826, page 454, is this notice:

"'*Rhus Toxicodendron*—Sumac, or poison oak leaves. A native of America. Medicinally subacrid, stimulant and narcotic. A very doubtful remedy. Applied externally for herretic eruptions, but is apt to excite erysipelas.'

"Miller evidently alluded to the plant mentioned by Mr. Veeder, and Rennie would seem to know of no other sumac than the poisonous sumac of America. Admitting Mr. Veeder's opinion of its virtues to be correct, something more definite respecting the plant is certainly desirable."

Considerable conversation ensued about the use of sumac leaves as a substitute for tea, some persons evidently fearing danger of poison.

Mr. A. S. Fuller said there is no danger of any mistake. The kind of sumac recommended (*Rhus typhina*) is common everywhere in dry land pastures, and is as well known to people generally as apple or peach trees. The Rhus toxicodendron, or poison sumac, is a very rare plant, and only found in wet land, and will not be likely to be mistaken for the other, which is quite harmless to touch or taste. A tea made of the berries is often taken for diseases of the throat. They are also used for coloring, and the leaves for tanning.

A Farmer's Pest in Ohio.

Mr. Caleb Munger, Perry, Wood county, Ohio, says the white grubs have become so numerous in all light soils, that the potatoe crop is materially reduced, and the roots of corn stalks are eaten off so that they fall to the ground, while the ears are ripening, and he wants to know if the Club can advise him of any remedy for this pest of the Ohio farmers.

Mr. Solon Robinson—I will recommend a liberal dressing of salt; also, lime, and always plowing in autumn as late as possible.

Remedy for Heaves.

The Rev. N. Young, South Addison, Steuben county, New York, says: "I took what well-cured smart-weed could be easily pressed into an eight-quart kettle, boiled two hours, poured off the tea, let it cool; then, with this I wet about ten quarts of wheat bran, and gave it at one dose to a horse that had had the heaves four years, and it proved an immediate relief, and has apparently effected a permanent cure. I gave about half the quantity to a two-year-old colt that had the horse distemper, and it proved to be all the medicine that he needed."

Bee Culture.

Mr. W. A. Flanders, "Practical Apiarian," writes a long dissertation upon bee culture, the only very strikingly new point of which is the following sentence: "Honey is a natural secretion, in greater or less quantities, in nearly all blossoms, provided, no doubt, to allure all honey-loving insects to visit it in their search for food." We are not quite sure, however, but that some other person may not have observed the same fact before. Mr. Flanders says that he has a new system of propagating Italian queen-bees, and "at some future time I will, if desired, explain my system in full."

Flax Culture.

Mr. S. W. Cone, of Bowdoinham, Maine, says: "The best land for flax is a dry, deep loam, with clay subsoil. An undrained clay soil should be avoided, also heavily manured land following other crops, there being a tendency to weeds, thus choking the young plant.

Newly broken ground or new land is best. In preparing the ground it should be left clean and light, plowing in autumn and spring, removing all stones and sods. Sow clean and very evenly, with about two bushels to the acre. Sow early in the spring, and roll the ground. Let it be weeded when two or three inches high, if needed. Flax should be cut just previous to the ripening of the seed; the fiber is best at that period, though for seed it must be cut later. For the new process of fibrilizing, it may be cut and cured like hay; and previous to braking threshed by the ordinary threshing machine. Two tuns of unrotted straw and twenty bushels of seed per acre form a good yield, and the crop does not impoverish the soil if those parts not used for textile fabrics are consumed on the farm. Beside making oil-cake from seed, the woody part after breaking, when unrotted, makes excellent feed for stock."

Mr. A. S. Fuller.—Is there any difference in the fibre raised from the light and dark colored seed.

Mr. Solon Robinson.—It has always been said that the flax grown from light colored seed has a softer fibre.

Experiments in the Culture of Potatoes.

Mr. L. R. Anthony, Hammondtown, N.J.—Some five or six years ago I read in a paper, I believe published by Professor Mapes, of a valuable compost for potatoes, as follows: lime, ashes, salt, plaster—three bushels of each, or twelve bushels to the acre, a large spoonful to each hill, scattered around, but not on the seed. I tried this, as directed, in Broome county, N.Y., on a light gravelly soil, with good results. I have been here three seasons. The first I tried this as follows: In two rows, I put the compost around the seed and left two without any; in two other rows I dropped the compost and covered it a little, on this I placed the seed and covered; in two other rows I dropped, covered it a little, then threw on the compost and covered it. On digging and measuring a slight advantage was found in favor of the two first modes, none in the second. This season I wanted a "brag crop," and procured the compost, dropped it in the hill and slightly covering it, and then dropped and covered the seed, which was Peach Blows. Digging showed the following results: one row, composted, measured 65 quarts, weighed 104¾ lb., counted 755, all told; one row not composted measured 74 quarts, weighed 130½ lb., and counted 900.

COST OF CULTIVATION.

Difference in favor of no compost, 26 lb., or near a half bushel. There was a perceptible difference through the season in favor of those not composted. They came up earlier, looked greener and grew longer. Twenty-six pounds in favor of no compost is in a 100 rows 2,600 lb., or a little over 43 bushels, which at 70c. per bushel, at which I am selling, is over $30. My present opinion is that this State was kept for a fish pond so late that the salt has not yet got washed out of it, hence an addition is detrimental. I am, however, inquiring, and if not otherwise satisfied, future experiments must decide.

Mr. Wm. S. Carpenter.—Ashes and salt is a good manure for potatoes. I am certain this manure is good for any land in Westchester county.

NEW VARIETY OF POTATOES.

Mr. Wm. S. Carpenter presented a new variety of potato, cooked and uncooked. It is called the prairie seedling; is white or yellow skinned, with a blush somewhat like pink eyes, and an uneven surface and grows large. The flesh is grayish white, and dry when cooked.

Mr. Robinson.—It has a rank smell which will condemn it for table use.

Mr. Wm. S. Carpenter said this variety yields enormously, and no doubt would be grown extensively for market.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

Nov. 24, 1863.

Mr. Martin E. Thompson in the chair.

MARL IN CANADA.

Mr. Carpenter, Prince Edwards Co., Canada, presented a deposit found in a pond near Lake Ontario, which appeared to be very minute shells of a white color. A farmer in the neighborhood had drawn this upon his land, and found great benefit from its use, especially upon corn and other garden products. He asked what soils it would be most beneficial to.

Mr. Wm. S. Carpenter.—This article would be very beneficial to clay soils.

Mr. Solon Robinson stated that he knew of beds of the same substance in the West, forty feet thick, so far progressed that nearly all the shells had become comminuted so as to lose their form, and in that condition the deposit is called "a marl bed;" and where limestone is scarce, it is sometimes molded like brick, and burned and slaked for the use of masons. It is beneficial upon almost every soil, but will not pay for long transportation any further than any other lime for use as manure.

Mr. A. S. Fuller.—I should think it excellent on any kind of soil.

PEAT FROM VERMONT.

Rev. Mr. Weaver presented a box of peat from the farm of Mr. Noyes, near Burlington, Vt.

Mr. Wm. S. Carpenter.—I took a piece of this peat home some days since, and found it to burn with a bright flame. I think it a valuable article for fuel.

Mr. A. S. Fuller.—No doubt this would be a valuable article for fuel whenever coal and wood was dear enough to induce people to dig it, but it would not be necessary for New Yorkers to go to Vermont for peat, as there were large deposits of it in New Jersey.

Prof. Mapes said it had been used for a long time for fuel about Morristown, and Mr. M. E. Thompson said that it was very abundant in Essex county, New Jersey.

Mr. Solon Robinson.—This kind of article has been in use for the last 30 years in Connecticut without creating any particular excitement. There is enough within three miles of the city of Brooklyn to last the people of that city for ten years.

Mr. Fuller said yes, a hundred years. Mr. Bergen said that he had always lived in Brooklyn, and did not know of any such great peat beds, and wanted to know where they were. Mr. Robinson and Mr. Fuller assured him that there were deposits forty feet deep on the top of the ridge near the reservoir, and in several other places. Mr. Bergen doubted whether it would be profitable to dig it for fuel or manure where coal can be had, and where farmers can get city stable manure at low rates.

The Secretary said that Mr. Richard Bacon had found large quanties of the article near his residence at Simsbury, Conn. Mr. Bacon had brought large quantities of the article to New York, but while the price of coal was so reasonable he had not been able to introduce it.

Prof. Mapes said that its use for manure would always depend upon locality, and the quality of the article called peat. That most suitable for fuel is a vegetable substance in a state of growth that will reproduce itself; but people are in the habit of calling almost all kinds of swamp muck by the name of peat. The substance that is deposited as sediment by rivers, or the salt marsh muck, makes good manure when properly prepared, but it wont't bear long transportation. The most valuable is that in deposits washed down from adjacent high lands, and least valuable that of the salt marsh. The true peat is so hard to decompose that it cannot be used with much profit as manure, and when burned, as it has been sometimes, to reduce it to a usable form, the ashes are found to be very light and of not much value.

If the peat is properly decomposed with the salt and lime mixture it makes an excellent manure. The floor under a shed should be sloped and made dish form; on this floor is placed the manure from the stable, on this seventeen times the bulk of muck; then another layer of stable manure, and again seventeen times its bulk of muck, and so alternate until you get the shed nearly full; the drainage is pumped up twice a week and distributed over the whole bed; this is conveniently done with a hose; if there is no drainage, then water is used the first time. I also dig a trench behind the cattle sheds, in which I place the decomposed muck; into this the urine from the cattle soaks; this, after ten days, is also placed upon the heap, and then seventeen times its bulk of muck.

This makes a capital divider of the soil, and when used in the drill when planting potatoes, it will be found very desirable.

Wine Maker's Guide.

Mr. H. J. Stauffer, Salem, Ohio, wants some trustworthy work on the Grape and the Manufacturing of Wine, especially the latter.

Mr. Francis Delvit, a French vine-dresser by profession, who formerly had charge of Dr. Grant's propagating houses, answered that there was no such work exactly suited to America.

Mr. A. S. Fuller said the best American work upon wine-making was written by Robert Buchanan, of Cincinnati. McMullen's work, and Mulder on Wine-Making, are probably the best European books.

Mr. Wm. S. Carpenter said that something better adapted to the wants of grape-growers in this country was now in preparation.

The Secretary—Col. Haraszthy, of California, has prepared a valuable work on the subject of Grape Culture, Wines and Wine-Making, it contains numerous plates of apparatus used in wine-making.

A New Fibrous Plant.

Prof. Mapes presented a new fibrous plant which he hopes may prove a valuable one for cultivation, as the stalks grow three feet high, one-fourth inch diameter, and covered with a thick coat of soft fiber of the very strongest kind. Mr. Fuller at first thought it was the marsh mallow (*Hibiscus palustrus*); but, being assured that this plant grows upon dry land, he examined the seed-pods, and decided it to be one of the asclepias family, and probably that known as "Indian Hemp," which is found in spots all over the country, but has never been cultivated.

Conceding that it can be cultivated, Mr. Solon Robinson asked the very pertinent question, what advantage it possessed over flax? Prof. Mapes thought the advantage was in this, that this plant is perennial, but Mr. R. thought that fact was not well established. Will somebody gather some of the seed of Indian Hemp, and experiment with it and report?

Subsoil Plows.

This question is asked by Mr. S. B. Elliott, Mansfield, Tioga county, Pa.: "Is Mapes's a good one? or, in short, whose is the best for a clayey loam, free from stems? where can it be got, and what the cost? If you have time to answer these questions, you will confer a favor on one who desires to improve his present cultivation."

Mr. Solon Robinson.—The gentleman has taken the first and most important step toward improvement, the desire for it. I will answer his question, that the subsoil plow, known as Mapes's, and which is sold at nearly all large agricultural warehouses, at from $8 to $18, according to size, is the only one that I would use under any consideration, if attainable. The only value of the one known as the English pattern, is for old iron. Mr. Elliott also wants to known about a subsoil attachment to a common plow, that has been spoken of in the Club. I answer, that is not properly a subsoil plow, it only scratches the furrows a little deeper. A real subsoil lifter attached to a turning plow would not be advisable, because it requires the force of a strong team to pull a subsoil plow alone.

Mr P. Quinn said that a two or four-horse plow working in the bottom of a furrow may be run 16 to 21 inches deep in old land, which had been previously subsoiled. A one-horse plow will work 6 to 9 inches deep.

Prof. Mapes.—The one-horse size should not be used as a subsoil plow, because it is too small to effect the proper object of a subsoil plow, but it is one of the most valuable implements in cultivating any kind of rowed crops.

Mr. Robinson and Mr. Quinn both recommended it highly as a marker for rows of potatoes and corn, as well as for working between the rows at times when the surface is clean; but the earth needs stirring, so as to let the air or rain water into the soil. It is also a great labor-saving implement in digging carrots. If run close to the row, it loosens the roots so that they can be pulled out with one-fourth the labor usually necessary. Mr. Quinn also stated that he had reduced the cost of digging a drain full one-half by using a subsoil plow in the ditch.

Mr. Wm. S. Carpenter said that he had used a subsoil plow to very great advantage in preparing land for an orchard.

SEEDLING SIBERIAN CRAB-APPLES.

Mr. Ambrose Balwin, Girard, Branch county, Michigan, having produced some very superior seedlings from Siberian crab-apple seed, is earnest in his recommendations to others to grow seedlings.

PEARS SUITED TO WISCONSIN.

Mr. George H. Adams, Danville, Dodge county, Wisconsin, objects to the proposition, made at a former meeting of the Club, that pear trees are naturally hardy as regards winter killing, and that such as are hardy at Boston should be so at St. Anthony's Falls. This he affirms is not so; that many sorts that are quite hardy at the East are very tender at the West, and that the following sorts are the only ones that can be recommended as far north as his place, as most hardy and profitable, viz: For summer—Madeleine, Osband's summer, Tyson; for autumn—Buffum, Belle Lucrative, White Doyenne, Flemish Beauty, Seckel; for winter—Vicar of Winkfield, Glout Morceau.

Mr. Fuller said that the difference in hardiness of plants here, and at Milwaukee, is very remarkable. This is particularly observable in cherry trees. Those that would stand 30 degrees below zero here, he has known winter killed entirely dead there at 10 degrees.

SUCCESSIVE CARROT CROPS.

Mr. P. T. Quinn, in answer to the inquiry, said: Carrots may be grown year after year to good advantage, if the ground is highly fertilized with something that will not produce weeds, as they are the greatest trouble in carrot growing, and are usually very bad after potatoes.

Mr. E. Williams, of New Jersey: I planted carrots three years in succession, and they failed the third year, though well manured. It is true the weeds were very troublesome, and that is the greatest difficulty in raising this crop.

Prof. Mapes.—Swell the seed, plant shallow with long scarlet radishes, and in the same rows which mark the line, so the crop can be worked before the weeds overwhelm it. The radishes can be pulled or crushed with a roller. One man grew carrots successfully in this way. He prepared the ground well, and sowed oats, and then drilled in his rows of carrots. He cut the oats early, and carried them off the ground at once, and began to work between the rows of carrots, and got good crops. The most of the growth is after the middle of July, and by that time the oats can be taken off.

Mr. P. T. Quinn said the best time to sow carrots was from 28th of May to the 10th of June, upon clayey soil, and earlier upon sandy ones. The yield of a good crop is 500 to 800 bushels per acre; but none, I think, have produced that this year, as there is a general failure. They are worth now 75 cents a bushel.

Mr. Wm. S. Carpenter.—I planted my carrots last season in June, they did not begin to grow until July ; I raised one of the best crops grown in Westchester county. I think we in general plant our carrots too early.

INFLUENCE OF THE MOON.

Mr. E. B. Harris, Glendale, Ohio. There is nothing I read with more interest than the proceedings of the Farmers' Club, and have been particularly interested in the discussions concerning the moon's influence upon plant and vegetable life. The affirmative and negative on the question display their respective characteristics ; the former declaring their belief in the moon theory simply because it is so; the negative ridiculing the very idea of such a thing. A blind faith is an excess on one side, and a blank disbelief on the other side ; but between those who so implicitly and those who so stoutly and sometimes flippantly deny an earnest seeker after truth has not found a very formidable array of reasoning on either side. To assert a thing is true because I believe it, and my father and grandfather believe it before me, is not truth, but tradition; and also to pronounce a thing absurd because I do not believe it, is presumptuous ignorance ; for know as much or as little as I may, ' there are more things in heaven and earth than are dreamt of in my philosophy.'

" In this controversy certain facts have been lost sight of which it would be well to recall. The empirical notion entertained by certain astronomers of the utterly lifeless waste of the moon's surface has been exploded. This idea of the moon's negativeness obtained credence by denying the existence of an atmosphere around the moon, consequently denying also the existence of water and organic life from our satellite. This theory led to the denial also of heat in the lunar rays, from all which flowed a multitude of errors.

" But Melvin and Knox have proved by exact observations that there is heat in moonshine, and Zantadeschi has measured its effects upon the mimosa ; while an English scholar has demonstrated that the earth is colder in the first quarter of the moon than it is in the second. Again, moonshine exerts a wonderful influence on plants. Light enables them to absorb carbon from the carbonic acid of the atmosphere, and this is their daily work. They sleep at night, except when the moon wakes them up, and sets them to work again. So the farmer is right when he sows his seed just before the full of the moon, for the plants come up about the time of the new moon, and pass their infancy under the dark nights. But when the full moon comes, its light sets them to work, and this process continues night and day, while the contrary course is injurious to the tender plant, which requires sleep. It is a common saying among sailors that the moon eats up the clouds, and Whewell and Quetelet have proved the truth of this observation, by showing that more rain falls in the dark of the moon than in its second or third quarters.

"So much for the influence of the moon upon vegetable and plant life. There are too many well authenticated proofs of its effects, to doubt its influence upon the human system. Persons sleeping in the moonshine have suffered malformation of the face, and very recently in Ohio, occurred a striking instance of lunar influence. A boy 14 years of age, slept throughout a moonlight night in a corn-field. Some laborers the next morning on their way to work, seeing the boy apparently asleep, aroused him ; the boy opened his eyes, but declared he could not see. He was removed to an occular institution, and the surgeon affirmed, after an examination, that the loss of sight resulted in sleeping in the moonshine. The boy is totally blind, and few hopes are entertained of his restoration to sight."

Mr. S. H. Oathout, Hardin, Clayton county, Iowa, says : "I commenced sowing barley the last day of the old moon (the moon changed from old to new about 11 o'clock a. m.), and sowed until about 10 o'clock, then quit ; left bags and grain in the field. At 1 o'clock commenced again, and finished. This I done for the purpose of trying the experiment, and was careful to note the result. The barley sowed in the old of the moon stood the usual height, heads long and large, and were well filled, the grains plump and heavy. That part sowed in the new of the moon stood about ten inches higher than the other, heads short and small, poorly filled, grains light and pointed. Here in this case the old of the moon furnished nearly double the grain of the new, and the new of the moon furnished nearly double the amount of straw of the old. The distinction between the two times of sowing was as plain to be seen as if one-half of the field had been raised up 10 inches. Many men saw this field of barley, and wondered at the difference."

Mr. Solon Robinson.—We do not wonder that they did, but we do wonder that it never occurred to Mr. Oathout, that the difference in growth might have been occasioned by the condition of the soil, or from the previous crop, or the influence of the position of the sun instead of the moon. We have known as great a difference in the appearance of a crop, occasioned by the time of year that the prairie was broken, and this difference will continue several years. It is surely a matter of wonder that a man of sense can have his mind so biased by old time theories, about the influence of the moon, as to believe that a difference of three hours in the time of sowing seed, would produce the different results which he has stated.

Adjourned.

JOHN W. CHAMBERS, *Secretary.*

December 1, 1863.

Mr. Nathan C. Ely in the chair.

EXCHANGE OF SEEDS.

A letter written from Iowa says, that the notice that he grew a superior kind of sugar corn brought him so many letters, that he believes that if some regular system of exchange of seeds could be adopted, it would prove a great advantage to the whole country. He suggests that seed be forwarded to the Secretary of the Farmers' Club for exchange.

THE CHERRY AND ROSE SLUG.

Mr. J. A. Donaldson writes from St. Joseph, that the slug mentioned by a Vermont correspondent, infests the pear, cherry and quince trees in that section, and makes the trees look as though fire had passed through them. He says: "I find fresh ashes a perfect remedy if industriously applied. The morning, when the dew is on is the best time to apply the ashes, but as the slug is slimy, the ashes will stick to them at any time. But it is better to have the ashes adhere to the leaves also. Orchardists here, who have a large number of trees to rid of them, use dry dirt, throwing it over the trees with a shovel. But whatever the remedy, it must be thoroughly applied, and repeated often. They commence their depredations in June."

Mr. A. S. Fuller said, that powdered lime was better than anything to destroy these slugs; and he would not put that nor ashes nor dust upon the leaves when wet. If the lime touches the worms, it will adhere to and kill them. The right time to apply it is when the slugs are on the upper side of the leaves. This pest has troubled him for fifteen years, both east and west, during which time he has used lime with success.

Dr. Trimble exhibited paintings to show the appearance of the slugs, and that the rose slug and cherry slug differ but slightly in color. The rose slug adhered more pertinaciously than the other to the under side of the leaf.

THE EARLY SAMARITAN POTATO.

Mr. J. C. Collins, New Albany, Indiana, thanks the Club for the information that the above named potato is a humbug, and thinks that such information will benefit others who might be induced to purchase it for seed. He also wishes further information about the straw-cutter mentioned by Mr. Carpenter, that would cut and crush cornstalks, and whether it could be worked by hand power?

Mr. Carpenter replied that two men could work it, but not economically. It costs $40, and he believed was called the Hitchcock cornstalk cutter and crusher, but it cuts hay and straw very well also.

SODA WASH FOR FRUIT TREES—LIME—DWARF PEAR TREES, &c.

Mr. A. C. Farmer, Cumberland, R. I., asks the following questions:

"I wish to ask the Club their opinion of washing soda as a wash for young trees? Will one pound to a gallon of water injure young trees? Also, the season and manner of applying lime to the orchard? Would shell or rock lime be preferable? Will pears thrive on moist ground, where water stands on the surface in a wet time? It is a dark loam six or eight inches deep, with a clay subsoil. Would the extensive cultivation of dwarf pears prove a profitable investment?"

Prof. Mapes: I have answered the question about soda wash for trees, so often, that I am sure that it need not be asked again. There is no danger in using the soda wash as recommended, one pound to a gallon of water upon any tree, as it does not affect live wood; it does remove dead bark, and makes the young trees look smooth and healthy, and it kills all worms it comes in contact with. Take common sal soda and heat it red hot in an iron vessel, and dissolve in water and use at once. There is danger in using potash too strong—there is none with soda. Lime upon trees injures them, as it coats the bark without cleaning it. Lime upon the soil should be applied upon the surface in small doses, say five bushels per acre, and I prefer autumn to any other season, because there is more wet to dissolve it, and it is only useful in that condition. I believe that shell lime is worth three times as much on the average, as rock lime, upon any soil. Gas lime is worse than useless, until it has been exposed several years to the atmosphere, and the pile should be frequently turned. If used fresh from the works, it will kill vegetation. Soapmakers' lime, if used in connection with soda, takes up its carbonic acid, and becomes crrbonate of lime—simply common chalk. It does take up a little of the glycerine of fat, when used in connection with soda, so that that part of the waste of the soap factory has some value. If ashes and lime are used together, the waste has more value. When soapmakers' lime or ashes have been a long time exposed to the atmosphere, they become valuable as manure. Fresh from the vat, the lime has but little value to the farmer.

As to the profitableness of dwarf pear culture, opinions differ. When successful, near a good market, the grower often gets five times as much as he would from any other crop. There is one thing certain, they will never succeed upon such a soil as the gentleman describes. What is meant by a dwarf pear tree, is a pear graft set upon a quince stock, which produces fruit earlier than upon a pear stalk, and it will fail sooner, unless it is planted with the junction below the surface of the earth, and then the pear strikes roots and becomes a standard tree, unless kept carefully cut back in a dwarf size and shape.

Mr. A. S. Fuller said that he believed a dwarf orchard may be made more profitable than standard trees, if the owner has his heart in the matter and is determined to succeed; though no man can hope for success on such land as this letter speaks of until it is underdrained.

I can raise a better crop and realize more from an acre of strawberries than I can from one acre of dwarf pear trees.

Mr. Wm. S. Carpenter—I am not now in favor of planting dwarf pear trees. I prefer standard trees. A great many cultivators now plant their trees three, four and five, and some even six inches below the juncture of the pear and quince. After a few years the pear roots make a great growth and the quince dies; in fact they become what is called standard trees. The greatest enemy of such trees is the borer.

Remedy for Borers.

Mr. Farmer, who wrote the above questions, says that the remedy for borers proposed some time ago by F. V. Thayer, Blackstone, Mass., he has proved a perfect success. The Club objected to Mr. Thayer's proposition, because it was a secret, and because so many similar secrets have proved worthless; but Mr. Farmer thinks the discovery so valuable that any owner of an orchard can afford to pay for it.

GRAFTING GRAPE VINES.

The following letter from J. R. Garber, Columbia, Pa., read by Solon Robinson, attracted the most marked attention of all present :

As I have been doing something in the way of grafting the grape under ground, and with pretty fair success, I will try and give my plan of operation, for the benefit of "whom it may concern."

"I prefer to graft the vine before the sap flows, as early in the spring as the frost is out and the ground is dry enough to remove from the roots, or to delay it until the vines are in full leaf and flower. Either plan is equally sure. From the last of February to the end of March, as the seasons are early or late, or from last of May to last of June. I have, however, grafted when the sap was flowing freely, and had the grafts grow. However, as the most certain, I prefer the earlier season—say two or three weeks before the sap starts—for this reason, that the grafts have a longer season to grow, and also from the difficulty of keeping the grafts in good condition so late; either they will push or they will become too dry.

"As to the 'great success of a certain man in Pennsylvania, who set Delaware grafts in Isabella and Catawaba layers by splitting them with a chisel and inserting the grafts in wedge form,' I have no certain knowledge, but presume him to be the same person who, a few years since, offered 'cart loads of Delaware wood to the public from original vines, simply for the cost of cutting, &c.' I would not have sufficient confidence even to try that plan; and as to keeping the earth from the grafts, it would, I believe, to be a pretty effectual plan to prevent their growth.

"I proceed as follows : Early in March, or as soon as the ground is free from frost and pretty dry—at least two weeks before the sap flows—I cut off the stocks three or four inches under the surface, or, if the roots are from one fourth to half an inch in diameter, cut them off, and graft three, four or half a dozen roots on one shoot. I simply split the stock or roots, as in grafting any other tree, stick in the graft, cut in form of a wedge, tie the stock with strong bass or other material to keep the stock from opening, fill in the earth level with the top eye on graft, stick a stock alongside the graft, then mulch over the whole with refuse hay, potato-vines or anything on hand. I use no wax, believing it to do more harm than good.

"I frequently keep the cuttings in slightly damp earth or sand till May, and even late in June, and then perform the operation as before. They grow equally as well, but the reason stated above, the early season is preferable. One graft set 25th June made 20 feet of ripe wood by fall !

"Two years since, spring of 1862, Mr. Rogers of Salem, Mass., sent me cuttings of sixteen of his best varieties, to be tested in this locality, Lancaster county, Pa. I grafted all of them on seedling stocks; fifteen of them grew, and thirteen bore fruit in 1863. One failure was owing to the root dying; your grafts on one stool made over one hundred feet of wood the first season, and many single grafts made from ten to fifty feet of wood. This season some of them bore from two to two dozen bunches of fruit on one graft, or on one stool.

"During the spring and summer of 1862 I grafted twenty-eight varieties; all but two are now fine large plants; most of them bore fruit this summer. Last spring, 1863, I grafted about a dozen new varieties; all are now fine plants, and nearly all will show fruit next year. Sometimes I take a branch, cut it off at a smooth place, stick in a graft or two, open a trench and lay the whole or a part in, and cover with soil, merely marking where the graft is buried, mulch, &c. To say, as some have asserted, that the grafts will not become firmly united to the stock, but are simply kept moist by the stock until they can throw out roots of their own, or that they never make durable plants, is anything but the truth, as I can at any time show to the satisfaction of any person who chooses to verify the fact. It is really astonishing to me that this 'grafting the grape' is so little understood by the 'knowing ones.' 'Time is money' in more senses than one, and especially so with the many new grapes that are constantly brought before the public. To get the little forced plants—as a correspondent expressed himself to me a few days since—'it takes a lifetime to get the fruits.' These spindly little forced plants may do well enough for young people who 'have time to wait,' but give me a good graft on a strong root, and in eighteen months I can taste the fruit.

"This season I had a fine little bunch to ripen on a graft set in spring. I hope you will tell all the members of the Club not to destroy their old worthless vines, with the object of replacing others in their stead—most likely to plant little forced plants—as they would in that case have to wait from six to ten years before they can even hope for a few delicate bunches of fruit. Now, if they will graft in the roots or branches laid down, they can have the new variety showing fruit the second year."

Mr. A. S. Fuller.—The trouble about grafting in this latitude is that we cannot operate in the ground at the most fitting time on account of frost. I have had good success in grafting vines, and I have done it in autumn, winter and spring. The latter period is the most uncertain, because if the operation is deferred until the sap flows, it will drown the graft. I prefer to graft a small vine, with a single cane, below the surface, but I have succeeded well by laying down a vine and covering it so that the upper bud of the graft is just above the surface. If I had an old vine of any inferior sort I would dig down to the crown of the root, and cut off the cane or canes, and graft them by splitting and inserting the graft just like that of any other fruit, being careful to insert it so that the inner bark and not the dry outside comes in contact. Then fill in the earth, but not over the upper bud, which I would cover by an inverted flower pot, and on that some kind of mulch to remain till spring, when it will be found that the graft is well united. If I could set the grafts in February, I should prefer that time, and would use canes the size of my little finger for scions. Any one can see the advantage of grafting who has a vine from which he could cut many scions, which inserted in a wild vine, or any cultivated one of little value, would give him fruit a year or two sooner than he could get it from such vines as nurserymen generally sell. If it is objected to grafting that the old root may die and the graft perish after a year or two old, I have to say that it is very easy to bend down the cane after its first year's growth, and cause it to strike roots. Vines may be laid down and have several grafts inserted by splitting the vine, but that is not so apt to make good vines.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

December 8, 1863.

Mr. Nathan C. Ely in the chair.

GRAPE CULTURE.

Mr. S. B. Nichols, Vine Cottage, Hammondton, Atlantic county, N. J., writes as follows:

"I am a beginner in grape culture, having some 700 vines in the ground, mostly Delawares. The first lot of 100 were set out in the spring of 1862, the balance last spring. Most of them made a fine growth of well-ripened wood, but all varieties—including Diana, Anna, Union Village, Lincoln, Isabella and Catawba—lost their foliage, and those that had fruit failed to ripen. The month of July was unusually wet and hot, raining almost every day. My vines were all struck with mildew about the 1st of August. The Concord was the only variety which held its foliage. All varieties were struck with rot throughout our settlement. In some localities the Concord rotted very badly, in others hardly a show of rot. I had some twenty bunches of Delawares which ripened on two-year-old vines. My soil is a sandy loam, with a clay subsoil. Would under-draining be an advantage to my vineyard, and prevent, in a measure, the rot another season? Many thousand vines have been set out here in the last two years, and many more would be put out another season if we were certain of a crop. Our strawberry and blackberry crops this year, were tip-top, and many thousand plants have been and are being set out. You will recollect that our settlement is some five years old, made up of New England and Northern people. Please bring this matter before the Farmers' Club, so that any information you may have will be of benefit to us another season."

Mr. A. S. Fuller.—I should not suppose that such land as he describes would require, or be materilly benefitted by under-draining. If water stands upon the surface it must be taken off, else he cannot grow grapes. Perhaps the difficulty was owing to the extremely wet weather in July. At that very time we were suffering from a drouth that parched up everything. This man commits an error in trying to get fruit from two-year-old vines. I have known young vines materially injured by allowing them to overbear. One man last summer allowed a young Delaware vine to bear 250 bunches. The consequence was that he did not get a single buch fit to eat; and beside that, he put back the bearing power of the vine for future years. One of the secrets of success with grapes is close pruning of both wood and fruit. With careful cultivation there is not much danger of mildew or rot. I had but one sort to suffer this year, and that was a neglected Herbemont—neglected because I do not consider it worth caring for. With proper soil and care in pruning and thinning the fruit, there is not much difficulty in growing any variety of grapes in this vicinity. One thing people should learn and practice—that is, never let a young vine produce fruit. We attempt by a system of forced culture to get grapes from vines three years old. A wild vine never produces at that age, but it does at a very old age. Wherever mildew occurs, it may be considered that there is a fault which can be remedied. Either the variety, cultivation, or soil is wrong, except in rare cases the peculiarity of a season may bring disease upon healthy vines. I think that the writer of that letter will succeed in getting a crop of grapes when his vines get well established.

Dr. Trimble said that he was not acquainted with the land at Hammondton, but he believes that much of the soil in that part of Jersey, though reported sandy, has a clay subsoil so near that it holds water, and must be underdrained. This disease of grape-vines, whatever the cause, is a serious matter, and well worthy of extended discussion. Dr. Underhill is a successful grape grower, and his land is not underdrained, though it is partly on a hillside, and some of it is quite sandy. He cultivates and prunes thoroughly, and takes off about one-third of the fruit that sets. With all his experience and care, many of his vines are diseased. It is very important to learn, if we can, what is the cause of this vine disease. It certainly is not the gas of a brick-kiln, as Dr. Underhill thinks, and when we learn the cause we may find a cure.

Mr. Wm. S. Carpenter.—Very much depends for success upon soil, situation, aspect, as well as cultivation, and it has not yet been settled which is the best of either.

Mr. R. G. Pardee.—I have yet to learn that vines will suffer from mildews, or the fruit from the rot, upon soil that is all right; and there are not many situations where some variety of grape cannot be successfully grown.

Mr. Frederick Preusser writes from Milwaukee, Wisconsin, as follows: "For the last two years at least 75,000 fruit-trees have been planted in Milwaukee county alone. Rochester sends its tree-peddlers all over the North-West, and much good has been done if only half the trees will grow. Fruit-growing has become popular. There is one branch whereof myself and others want a little light. What varieties of grapes will grow and ripen between 42 degrees to 45 degrees north latitude? There are, no doubt, grape-growers in the Eastern States, from New York to Maine, and we want the names of the varieties and the *date* of ripening at 43 degrees north latitude. Give us the day of the month as near as possible, and don't say 'It ripens ten or twenty days before Isabella.' Catawba and Diana won't ripen here, nor have I seen a ripe Concord. It is said the grape needs a mean temperature of sixty-seven degrees in September to ripen well. Now September, here in Milwaukee, for the last eight years, has only a mean temperature of from sixty to sixty-two degrees; but the first twenty days of September have a mean temperature of sixty-four degrees. I, therefore, believe we may grow such grapes as ripen the first twenty or twenty-four days of September. What is the difference of time as to the ripening of grapes in the degrees north or south? Will you bring the matter before the Farmers' Club for discussion?"

Mr. A. S. Fuller thought he must be mistaken about Concords, and that they will ripen fruit at Milwaukee if not allowed to overbear. He said that he had known Catawbas to ripen at that place, but they are very uncertain; but he is certain that Concord, Delaware, Hartford Prolific, Allen's Hybrid, and Creveling, may be made to ripen fruit there upon old vines, carefully pruned, trimmed low, and not allowed to bear all the fruit that sets. It may also be necessary to lay down the vines in winter. I have seen all these sorts ripen in the northern part of this State. I cannot give the exact time of ripening at the point indicated by the writer of the letter just read. In this vicinity, Delaware and Hartford Prolific ripens from August 25th to September 15th ; the first generally from the 1st to the 10th. Concord ripens from September 10th to 20th, and Diana, if it ever ripens (which it seldom does), should be ripe with the Concord. Allen's Hybrid ripens September 1st to 15th ; so does the Creveling, which is a very good grape. The Diana I would not recommend to anybody, because it does not ripen one year in ten to give satisfaction to any one, not even a careful nurseryman, much more to people who are not careful. It is a good kind of grape when properly grown and fully ripe ; but is there a man or woman in this town who ever saw it in that condition. I denounced the Diana three years ago as unfit for general cultivation, and was denounced in turn by those who had read some extravagant accounts of its perfections. I have not changed my opinions. Others have. I know a great many who have tried to grow the Diana who are dissatisfied. I noticed in the grape shows this year a few bunches of well-ripened fruit, but the most of those exhibited, and of course the best that could be selected, showed many green berries mixed through the bunches. Why should we try to grow a variety that will not ripen, while we have so many that will ? One of the strongest objections to the Diana is its remarkable odor, which reminds one of cats, until it is very ripe, when the odor disappears.

Dr. Trimble said that the most important thing to be considered by those who desire to ripen grapes, is not the exact time laid down for their ripening, which always varies with circumstances, but "How shall I keep my vines healthy ?" Because we do know that healthy vines will produce good fruit here about every season.

The Rev. Mr. Weaver, who devoted a good deal of attention to fruit at Fordham, a few miles north of the city, corroborated Mr. Fuller's opinion of the Diana ; he had never succeeded in ripening this variety with any satisfaction. He wanted to inquire of Mr. Fuller if two-year-old vines should ever be allowed to bear fruit ? Mr. Fuller answered only one or two bunches, just to test the kind and quality.

Mr. R. G. Pardee.—I have yet to learn that the grape, under proper cultivation and soil, is liable to mildew. I have grown some thirty varieties, and have not been troubled with it.

Mr. Wm. S. Carpenter.—The Diana is not a good grape, I have discarded it from my vineyard ; it has a strong musky smell ; still I have eaten them grown in this city that were a passable grape.

Management of Hay in Mow or Stack.

Mr. S. M. Root, Pittsfield, Lorain county, Ohio, wants the Club to discuss the above question. He says : "I find by traveling the country that there is a great diversity of opinion on this subject, at least one would so judge from the fact that some stock raisers cut down their mows of hay in squares of five or six feet, while others feed from the whole of the mow, containing, in some instances, five or six hundred square feet of surface."

Mr. Wm. S. Carpenter said: All my experience favors feeding from as small a surface of the mow as possible, and to save the labor of cutting down the mow, I have adopted the plan of stowing the hay in divisions, by setting up boards and filling one compartment at a time. Mr. Fuller inquired what he would do if the hay was stacked, and Mr. Carpenter replied that he would not put hay or grain in stacks; was a wasteful way of storing it, which no farmer could afford, and which no good farmer would practice.

Mr. Solon Robinson.—I take issue with the gentleman upon that point. Good farmers do stack hay and grain, and good farmers can afford to do so. In new settlements stacking is absolutely necessary. In old farming regions, as old as England, it is practiced upon economical principles, but stacks are not left to waste as they are here upon the surface, but are protected by a thatch that sheds rain equal to a roof. It is an error to teach farmers that it is bad economy to build stacks. It is not economy to allow them to stand exposed to the weather. It is not economy to uncover a stack to feed it out. It should be cut down, a third or half at a time. It is just as easy to make sheds to shelter cattle to be fed from the stack as from the barn. It is true that hay is stacked and fed in a slovenly way, but that is no argument against the system, which must be practiced by nine-tenths of the people in newly settled countries, like the Western prairies, and if stacking is well done it may be practiced with profit in old districts.

The Chairman thought there were certainly two sides to this question of stacking, and that farmers might be benefitted by discussion. For his part, he thought there were many things in favor of stacking. It certainly saves a great outlay for building material.

Mr. Pitt, an English farmer.—I am a stacking man. It is nearly a universal custom in England and Scotland to stack grain in the open air. Our climate is more uncertain than it is here. We have more humid weather there. As to housing wheat, it is generally thought that such grain has a musty smell. In Silesia I have seen stacks of grain that have been made for ten years, and had to be rethatched after the first had decayed.

The Barometer as a Farm Implement.

Mr. Solon Robinson.—The same writer who started the question we have just been talking about, wants the Club to discuss the following question: "The benefits that would result to the farmer from having a barometer for the purpose of foretelling the weather, so as to avoid loss by crops or farm products being exposed to storms when they might be secured, had the owners something to indicate to him the changes in the weather." Exactly so. If he had such an implement he would undoubtedly avoid loss very often. The question is not whether such a weather indicator would be beneficial, but whether such a thing can be obtained. We have discussed this barometer question enough, I should think, to satiate every reader of these reports. Perhaps, and probably he has not read the many testimonials given in our discussions of the question, of the utter worthlessness of a barometer to a farmer for the purpose of "foretelling the weather."

The Chairman said that he had lately read of a case where a certain minister caused the bell to be rung one day to alarm his parishioners, so that he could tell them what he had learned about the future of the weather by consulting his barometer, and by that means he enabled them to save a great quantity of hay.

Mr. Solon Robinson.—This may be true in one single case, as it is certainly true of many cases where the indications have entirely failed. It is true that the rapid fall of the indicator prognosticates wind, and, in haying time, wind often brings along thunder clouds and rain. But as to any certain indication of rain, I have never been able to see it, and do not believe that any farmer will ever grow rich upon a reliance upon such a fickle indicator of the weather.

To this we add that on Monday of this week the barometer rose to a high point, and on Tuesday it went down below the starting point, indicating, if it is to be relied upon to "foretell the weather," that we should have a stormy night. It was clear and pleasant in all respects. On Wednesday morning it was cloudy, and the barometer-wise said, "It will snow before night." But it did not; nor did it rain; it only blew a gale. So, if the barometer indicated anything, it was wind, and that is all it can be relied upon to indicate, and that is not certain; nor is it certain whether it will commence blowing an hour or a day after the fall.

A MINNESOTA WILD FLOWER.

Mr. J. C. Stratton of Woodland, Wabasha county, Minnesota, writes to Mr. Solon Robinson as follows: "I inclose a dried specimen of a double anemone thalictroides, which I found growing wild five or six years ago. I should be glad to know if it is in any of the collections of flowers of Eastern florists. It begins to blossom almost as soon as the frost is out of the ground, and continues until June. Its desirable qualities are, that it is perfectly hardy as far north as 44°, and probably further; blossoms in umbels of four or five, each blossom contains from one hundred to one hundred and fifty petals of a delicate pink color; blossoms early, and continues long in bloom; it is propagated by tubers. It is small, growing only two or three inches in height—in fact, a gem of a flower. So it is. So said all who were present, and a vote of thanks was passed to Mr. Stratton, with a request that he would send a few of the tubers to the Secretary of the Club, for the purpose of testing them, as, in the opinion of Mr. Fuller, the flower is not in any collection here, and if it should succeed, would be quite an acquisition.

THE WINE PLANT—LINNÆUS RHUBARB.

Mr. Wm. S. Carpenter called attention to the monstrous fraud practiced on farmers in the western part of New York and further west, by peddlers who are selling roots of "the genuine wine plant" at $3.75 per thousand, assuring the purchasers that they can make untold quantities of wine that will sell for $2 a gallon. These roots are simply the Linnæus rhubarb, and the wine is no better than can be made from other varieties of rhubarb, and several kinds of acid fruit, by the addition of sugar.

Mr. A. S. Fuller said that parties have been buying up all the Linnæus rhubarb roots to be had about the city, and, of course, they are selling them at an enormous profit, and cheating everybody who buys them. But it is no use to expose the cheat; that has been done repeatedly. The Tribune published an article last spring exposing this humbug, but it did not stop it. There is a class of heathens in the country who never read, or, if they do, they never profit by what they read.

Mr. Wm. S. Carpenter.—Some days since my attention was called to the ill effects produced from the use of the rhubarb plant, so much so that its use has been discarded in some sections of the country.

Dr. Ward.—The leaf is poisonous, the stalk edible, and the root purgative, having the effect, in a milder degree, of the Turkey rhubarb.

FRUIT INJURED BY PACKING.

Mr. Wm. S. Carpenter exhibited several specimens of finely preserved apples, and Mr. Ely some specimens that looked as though they had been slightly scalded, the skin having turned dark, while the inside remained sound, and he wanted to know the cause of this discoloration.

Mr. Wm. S. Carpenter answered that it was caused by packing the apples in tight barrels before they had undergone the sweating process, which all apples should go through after being gathered, either by piling, or, if put in barrels, by leaving the head out for a few days.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

December 15, 1863.

Mr. Nathan C. Ely in the chair.

PRESERVING APPLES BY CONDENSING.

Mr. A. Steinbach writes from Evansville, Indiana, and sends a sample of condensed apple pulp, made in Prussia five years ago, and still in an eatable condition; and Mr. S. thinks that it would be useful for people in this country, where fruit is abundant, to put it up in the same way for the use of sailors. We judge from the looks of the article that it is pulped, pressed and baked, as it has much of the appearance of manufactured tobacco. It is said to be very healthy and palatable when cooked, and that it keeps in this condition much better than in the usual manner of drying apples.

The Secretary was requested to write to Mr. Steinbach, and ask him to furnish to the Club the receipt for its preparation.

INCREASING VALUE OF OAK TIMBER.

A friend at the West, thinks that farmers generally, and particularly those who own timber land, should be informed of the greatly increased value of oak timber. He says:

"The extent of the oil trade in Pennsylvania, may be inferred from the sweep taken for barrel timber. A single firm in the oil barrel business, are this winter getting out three million feet of oak in North-Eastern Wisconsin, and have already erected buildings for the machinery to prepare it for shipping. Good oak timber lands up the Allegany river and branches, have appreciated wonderfully in value in the past two years. Oak lumber has been lately sold in that part of New York State for oil barrels, at $8 per 1,000 feet board measure, 'on the stump,' where formerly, or say three years since, $2 per 1,000 feet was the highest price thought of.'"

In other places the draft upon oak timber, for shipwrights, has enhanced its value more than as above stated. Every farmer who has a young oak growing where it will not interfere with his crops, may consider that he has a valuable deposit in bank, at interest for his children, in the growth of the oak tree.

Inquiries about Manure for Fruit Trees.

Mr. Bird, Mount Pleasant, Iowa, asks the following questions:

First: What chemical elements of the soil are exhausted in the cultivation of nursery trees and shrubbery?

Second: Will the application of barn-yard manure restore to the soil the elements thus exhausted by the cultivation of nursery stock? or

Third: What additional application beside barn yard manure is necessary to restore said exhaustion?

Mr. Wm. S. Carpenter remarked that he had had a good deal of experience in growing trees upon a worn-out soil, and he has found that it requires more potash than is contained in barn-yard manure, and he has therefore found an application of wood-ashes, at a price not exceeding twenty-five cents a bushel, the most economical fertilizer that he could apply to a young orchard.

Mr. A. S. Fuller replied, that, as a general rule, it may be said that the cultivation of ground in trees will exhaust all the elements, though slowly. I do not think any artificial manure is as good as the natural new virgin soil.

Dr. Trimble says that result would follow only in poor soil. In relation to the question about manure, the general opinion is that barn-yard manure does contain all the elements necessary to restore any soil to fertility, but he has found, in cultivating nursery trees a good many years, that such manure induces a large growth of wood and foliage, but it is not as healthy a growth as when made by some other substance, such as a compost of wood mold, leaves, &c. Some soils that are exhausted can certainly be restored quickly by other fertilizers than by barn-yard manure. As to the third question, no one can answer that, because two fields, only divided by a fence or road, may require an entirely different treatment.

Corn Stalks as Fodder.

Mr. C. M. Bowen, who says he profits by reading the discussions of this Club, thinks that corn-stalks should be kept, if possible, in a moist condition. If no better place can be found, make a long stack with the buts to the weather on each side, when perhaps they will do to fodder till spring. Corn-stalks contain so much valuable nutriment for cattle, especially milch cows, that a proper method of curing, saving and feeding them would be very acceptable.

Cutting dry stalks in a machine for food is still worse than feeding them whole, as more likely to induce cattle to eat the indigestible stalks. He had a cow which he thinks was materially injured by this kind of feed, the stalks being very dry and hard when fed.

Dr. Trimble said he had seen a great many corn-stalks fed to cattle, but never saw them willing to eat the but end of the stalk, unless driven to it by starvation, and he thought that a pretty strong evidence that they contained little or no nutriment.

Mr. Lux said that he had fed the stalks of sugar-corn most successfully, the cattle eating the whole, and apparently digesting their food perfectly. He cuts them in a No. 2 Eureka machine, which cost $32.50, and not only cuts but mashes the stalks, and the chaff is fed mixed with bran and water. I prefer the stalks of sweet corn.

Mr. C. M. Brown, Chelsea, Michigan, writes his opinion of stalks as feed —that they are worth, when cut in this way, as much per ton as uncut hay.

Mr. Carpenter said—I have satisfied myself that stalks cut green and chaffed are more worth, ton for ton, than the best timothy hay. A ton of cut stalks will last twice as long as a ton fed whole. One of my neighbors cuts and steams his stalks, and finds great advantage in that practice. I find one ton of cut stalks will feed four cattle thirty days. As we double the value by cutting, I believe it more than pays the expense.

Mr. Solon Robinson contended that the but end of the stalks of corn which have ripened the ears, contain no more nutriment than any other woody fiber, and are really not as valuable as the twigs of any sweet wood, for instance, ash or maple, would be if passed through a chaffing-machine, and prepared in the same way as Mr. Carpenter says he prepares his stalks. If the stalks are cut from the green corn and well cured, and fed before they lose all their moisture, they are really very nutritious food; or if the corn is cut up from the ground while still green, and set up in shooks to ripen the ears, the buts will contain some nutriment. But even then it is a very doubtful question whether those of the large varieties of corn will pay for the expense of passing them through a cutting-machine.

Mr. Enos Stevens said that he had experimented considerably upon cornstalks, with a view of testing their value as food for cattle. He has always noticed that green stalks have a pleasant, sweet flavor, but those which ripen the grain, when dry, have no taste, and appear to be quite unnutritious. If they are ripened in the field, he is sure they are quite indigestible, no matter how they are prepared to induce cattle to eat them. After the corn is glazed, the stalks, if to be used as fodder, should be immediately cut and cured above the ground. He has found by experience that he can do this for $3 per acre, by putting rails upon forked stakes through the field, and then laying the stalks upon them. When laid upon the ground to cure, unless the weather is unusually favorable, they will sour before they are dry enough to put in stacks.

Mr. Lux inquired what he should do with a lot of Virgalieu pear trees which he has just planted out, as he has been told since planting them that he cannot produce this variety near the sea shore.

The Chairman said—It is an error to say they will not produce fruit near the sea shore, though I suppose they are uncertain, for I have a tree growing very near the salt water that does produce excellent pears.

Dr. Trimble said—I have seen Virgalieus this year in several places in this vicinity that were entirely healthy.

Mr. A. S. Fuller said that might be the case, but he could not recommend the gentleman to grow the trees expecting to get good fruit, because, as it is well known, the Virgalieu pear, for several years past, has almost universally failed.

The gentleman said—What, then, would you have me to do!

Mr. Fuller replied—Graft other varieties; and, in answer to the question when? replied that he would do it at once.

Mr. Carpenter said that he would not graft the first year. He would let them grow one year, and then graft one-third, and the remainder in the two succeeding years.

Mr. John G. Bergen said—My experience is that it is better to graft the first year. If the trees are planted in autumn, I would graft them the next spring. This is particularly the case with the cherry.

Mr. Fuller said that he would transplant and graft at the same time, cutting off two-thirds of the top, unless in cases where the trees had been transported a long distance, or kept out of ground until the limbs were too dry to graft. Nine-tenths of the nursery trees are so much injured by drying, that most of the top and roots should be pruned away. If trees are grafted when they are transplanted, the growth of the graft is slower, but more hardy and sure to live.

Mr. Bergen is sure that more grafts will live set in transplanted trees than in trees that are not removed. As to the Virgalieu, it is not a safe variety to plant, yet I know trees which produce good crops of excellent fruit every year. There are some other sorts that are not to be depended upon—Vicar of Winkfield is one that does not rank high in my estimation.

Mr. Fuller said that he esteemed it the highest among 400 sorts that he had grown.

A Plea for the Isabella Grape.

Mr. Geo. W. Gage writes from Chautauqua Co., N. Y., as follows:

"In your Club discussion, held Nov. 23, you say you are glad to give others the opportunity to speak freely. I accept the offer. At that meeting, while talking over the merits of the Isabella Grape, you observe that it is a great waste of gas to try to keep up the balloon that has so long held the Isabella Grape above all other sorts, and charge its friends with great sensitiveness whenever its merits are questioned. Now, I am not going to waste much gas in an effort to keep up the balloon you mention. Neither do I feel any great sensitiveness on the subject much preferring that the Isabella and all other sorts should stand upon their own merits, neither attempting to disparage nor extol their qualities, not considering the judgment or taste or interest of any one or two individuals as conclusive in the matter. The Isabella has been in cultivation in this county for many years, and continues to hold a fair rank among the many varieties more recently introduced. The Diana, Concord, and Delaware, and many others, are cultivated in our vicinity, all good, but the old Isabella holds on hardy and vigorous, and giving abundant crops and as yet the pigs have not enjoyed a very large share. I know of but one instance in this county where the Isabella has been threatened with extinction, and in that case the Concord was to be its successor—the Diana and Delaware were eschewed. The adjoining vineyard of fifteen acres still holds on to the Isabella. Among those with whom I am acquainted no one considers himself deceived in the quantity or quality of the Isabella, which can hardly be said of those kinds more recently introduced. But what I wish to ask is, who inflated the Isabella balloon? A. J. Dowing, Chas. Downing, P. Barry, John Phin, and Dr. G. P. Norris of Delaware, have each, I think, furnished a portion of gas—all speak highly of it, and place it in their select lists. Now, contrasting what they say with what you say of the Isabella, what can we say? You say the Isabella is not even third rate. Mr. Phin published his book in 1862, and Dr. Norris furnished his article to the Patent-Office in 1861. These gentlemen could not be ignorant of the new varieties you mentioned as first rate, nor of the merits of the Isabella, and if that grape is as insignificant and insipid as you say it is, how, if honest, could they at this late day recommend it so highly, and thus impose upon the public? Does it not look as though interest or dishonesty was peeping out somewhere? Again, how is it that members of the Club have been so slow to give the public warning of the worthless character of the Isabella. It has been in cultivation more than thirty years at the north, and all that time open to criticism, but not until thousands and tens of thousands of dollars have been expended in purchasing, planting, and cultivating this worthless grape does the warning come. Saul held the clothes of Stephen and consented stood looking on while the mob stoned him to death! If Dr. Ward wishes to destroy his Isabella vines no one out here will object."

Mr. Solon Robinson—I am not going to reply to this letter; those who read it will judge how far the writer has made out his case, and whether he is sensitive opon the subject. I will simply inquire what the owners of Isabella vineyards are to do with their fruit when they cannot find a market for it, as it certainly is not a good wine grape. I have never said that it is not a passably good grape, when fully ripe, though it is inferior to half a dozen other sorts, which will ripen where it will not. And I do say that many of the Isabellas sold in this city are unfit to eat, and more failures have occurred in planting Isabellas than all other sorts.

Mr. Wm. S. Carpenter said that the time will come when the writer of that letter, and others who so strenuously recommend the Isabella as the best of grapes, will be laughed at, the improved varieties are so far ahead.

Mr. John G. Bergen said that he should still defend the Isabella, because it does give satisfaction in many localities. As to its quality, that is a matter of taste. Mr. P. B. Mead says that a person cannot eat freely of this sort, without getting a sore tongue. This I deny; I can eat them all day and not make mine sore. I say there are very few better grapes than this when it is fully ripe, and so the National Pomological Convention must have thought, or it would not have retained it upon its list. It has been thirty years in cultivation, and if the new sorts stand as long I shall be glad. With me the Delaware is a very small fruit, and the Clinton, that I thought so hardy, rotted this year. It is the height of absurdity to discard an old well-tried sort, until we have proved the substitute.

Mr. W. S. Carpenter said that the Pomological Convention did not recommend the Isabella at its last session, but instead of that gave the localities where its cultivation proved successful, and it bore relations to other sorts as follows: Isabella, 14; Delaware, 22; Concord, 22; Allen's Hybrid, 21, and several other sorts which succeeded in more States or parts of States than the Isabella. Mr. Carpenter said that he had no interest, except that of his earnest wish to see grape culture succeed, to induce him to oppose the planting of Isabella vineyards. He certainly could not recommend a friend to plant a variety which he does not believe has proved fully successful at the rate of one vine to every one hundred planted. And the general failure of the vines to remain healthy, and failure to ripen fruit so as to satisfy those who grow it, as other varieties have done, has certainly done a vast amount of injury to vine culture in this country. If there had been no failures—no sad losses by those who have started vineyards of Isabella vines, there would have been a thousand vines producing good fruit where there is not one now. Many persons have become so disgusted in their attempts to grow Isabellas, in my neighborhood, that they will not listen to a suggestion to try any of the new varieties, which so far have given eminent satisfaction.

Mr. A. S. Fuller.—If there are localities where the Isabella succeeds so as to give satisfaction, there let it be cultivated; but pray let us urge its friends to try some other sorts, and not be satisfied with this if there are better ones. If that will grow and you cannot grow any thing better, I beg all to grow that—grow grapes of some kind—if nothing else, grow a wild fox vine and let it run over an apple tree. And if you can not learn to cultivate a nursery vine after the most approved method, still let me urge you to plant it, and let it run wild; it will produce some good fruit. Several sorts such as Concord, Hartford Prolific, etc., will grow in a sort of wild way and produce fruit that is better than none. Anything, even the most foxy wildling, is better than nothing. Plant something. If one fails, try another. One will succeed in one place and fail in another. I esteem the Delaware as the most trustworthy of all, yet that has failed; and at best it is a sort of dandy, as compared with the robust Concord. The Clinton is considered one of the most hardy of all, yet here is Mr. Bergen to tell us that it rotted with him this year. But that should not deter his next door neighbor from trying it. But what I wish to say to every owner of a foot of American soil, is, plant a vine. Do not fail to grow grapes for your family. If one sort fails, another will succeed. If all fail this year, do not be discouraged and give up, but hope for success another year.

How to Make Cisterns in Springy Ground.

Mr. S. D. Newbro of Lansing, Mich.—If any body will follow the accompanying directions they can make a cistern in springy ground, and even cement against a spring that lets in water fast as one man can pump it out, provided the fountain-head is not so high as to cause the water to overflow the top of the cistern. Of course, when the water in the cistern stands on a level with the fountain-head, there is no action anywhere to interfere with the cementing process. You will confer a favor on the public by publishing.

Dig a hole of the best shape to suit the nature of the ground. If the ground is sandy and cannot be plastered, then, of course, make a wall of brick or stone, laid in lime mortar, using extra care. If the ground is sufficiently clayey not to cave, then plaster upon the bare earth. The water will come in of course, and if it comes very fast, it may be necessary to keep it pumped out till the plastering sets—say from three to six hours. Then let the cistern fill and everything rest for a few days. The plastering will be hard. Pump out and plaster again so that the two coats will make everything secure except where the springs prevent. Keep pumping the water out for a few hours till the mortar sets; then let the cistern fill. Rest a few days. Don't pump out the water then, but sprinkle or sift into the water from a peck to two bushels of dry water-lime over the bottom of the cistern, and especially over the leak-holes. The lime will settle and cement every hole effectually. Rest a week and pump out the water. If the spring holes are in the sides, build up some kind of staging of material that will not float. Let the cistern fill. Then sprinkle in the water-lime so that it will settle on the top of the staging opposite the spring-holes. A piece of sheet iron may be laid over the hole, and at a little distance from it, and held there by a crowbar; and after the cistern fills, the water-lime may be introduced so as to settle behind the sheet iron and cement the leak.

An Improved Cultivator.

Mr. Ephraim Briggs, Medina, Ohio, sends us a cut of an improved cultivator, which certainly looks to be what he thinks it is, an improvement upon all its predecessors, and in asking such notice as it may be thought worthy of, he says that he believes "the farming community will be more benefitted by it than I shall, although I am a poor mechanic and not able to employ the necessary means to bring it properly before the public," and he wants to know if it is in accordance with the plans of this Farmers' Club to test new improvements in farm implements, and then, if found worthy, to commend them to others. Such should be one of the objects of every Farmers' Club, and this has frequently been the case here, and as frequently, if the article deserved it, it has received a pretty severe condemnation. Of this improvement Mr. Briggs says:

"It has been my study for quite a number of years to get up a cultivator that could be so shifted and changed as to do all the work in the different stages of the crop with one machine. How well I have succeeded you will, of course, be able to judge after having fairly tested one of my machines." It appears to be made of five teeth, like small shovel plows, so arranged as to make the cultivator wide or narrow at will, and to turn the dirt to or from the rows, and Mr. B. says: "It will do as much and as good work going once as a common mold board plow at twice. Beside cultivating, it has been found an excellent potato digger. The front shovel is about five inches wide, and the hind one about eight. The two outside shovels, when placed together, would make a large shovel plow blade, and are all made of steel. The implement weighs about fifty pounds, and the draft is light in proportion to the work that it does. Three of the best farmers in our country planted their corn with it this year, and say it saved them the labor of at least two hands."

Adjourned. John W. Chambers, *Secretary.*

December 22, 1863.

Mr. Nathan C. Ely in the chair.

How and When to Plant Apple Seeds and Grow Nursery Trees.

Mr. S. T. Hill, Doria, Dixon county, N. T., asks what is the best method of planting apple seeds, and what is the best time in the season? The above question may have been before your Club as much as necessary for the public good. Indications are that this country is well adapted to all kinds of hardy fruit trees. I desire to make a trial with apples. There are a great many persons in the same category, and therefore others who already know must bear with repetition of questions and answers.

Mr. Wm. R. Prince answered this question in substance, that the best way was to put the apple seeds in sand as soon as they were worked out of the pumice, and put the box in a cool, dry cellar to remain till March in this vicinity. Then prepare a rich loamy soil, very mellow, and manure it well with fine, perfectly rotted stable manure, to give the trees an early start and make them grow vigorously the first year, as that is of the greatest importance. Plant the rows 2½ feet apart, for horse culture, or wide enough to hoe between, for hand culture.

John G. Bergen.—I have found that all sorts of seeds, apple, pear, peach, plum, cherry—do well if planted while still fresh and moist from the fruit, and all single seeds, like peach, do the best if planted in the pulp as they grow.

J. S. Rounce, jr., High Forest, Olmstead county, Minnesota, inquires:

"1. Would cleared oak land, pretty high, somewhat rolling, and not much brush, on the bank of a small river, and well sheltered by timber, be suitable for a nursery?

"2. Would the decaying roots of trees be injurious to anything in the tree line. I think they lie too deep to affect nursery trees, but when they grow larger, I am in doubt?

"3. Would an application of lime or salt, or both, counteract the fungoid influence of said roots?"

Mr. Prince said he should consider the location described a very favorable one in all respects.

Mr. Wm. S. Carpenter said that the gentleman might judge from his experience whether the roots would be deleterious Ten years ago he cut off a piece of woodland, principally oak, and after cultivating it three years, to subdue it, planted an orchard extending from the new ground over a piece long cultivated. Now, the trees on the new part are nearly double the size of those on the other part, and the fruit is larger and better.

Prof. Mapes said that an application of lime would be beneficial, whether or not necessary to affect the fungoid influence of the decaying roots.

Wild Plums of Minnesota.

The writer of the above inquiry says: "The wild fruits of Minnesota are fine, and there are several varieties—yellow, red and purple—different sizes; some sour and uneatable, while others are sweet and good. Some kinds ripen four to five weeks later than others. The latest I have found is large and round (average 1¼ inches diameter), and very good, but it is green and hard as a stone when all others are ripe. It is a prolific bearer, but quite scarce. I have seen only three trees, and those small, although I have traversed the timbered portions of the State considerably. I find the wild plum runs to variety; the seeds of one tree produced four different sorts of different color, size and quality. One of your correspondents says the wild plum is not affected by black knot, but I have seen many that were entirely destroyed by it. The wild cherry is also affected. It is worst where fire has injured the trees."

Mr. Carpenter said that a friend in Connecticut received five sorts of wild plums from Iowa, which he has successfully grown, producing crops almost as certain as apple trees, and not affected by curculio.

Mr. Prince said that we have twenty sorts of plums that are not affected by black knot. There is one purple damson that shows no sign of that disease when grown side by side of the common damson that is covered with knots.

CAN BRICK BE MADE WITHOUT CLAY.

Mr. R. M. Ormsbee, Porter's Corners, N. Y., says that he lives eight or nine miles from where any good beds of clay exist for brickmaking, and wants to know if brick can be made without clay? There is sand, gravel and sandy loam in his neighborhood.

Mr. Solon Robinson.—In The Semi-weekly Tribune of Dec. 18, there is a letter of mine, which describes how concrete brick are made, at Vineland, N. J., of lime, gravel and loam, and I presume that the same kind could be made in this gentleman's locality.

Prof. Mapes.—These bricks are used without burning. Burnt brick cannot be made without clay, for that is the philosophy of all manufacturers of this kind. Burning the moistened and well-tempered clay changes it to a hard, stony substance. One of the secrets of making concrete is to use a very small quantity of lime, and thoroughly incorporate it by working, and the impure limestone, such as Rosendale cement is made of, would be better than pure lime for concrete work. Too much lime is generally used in mason's mortar. To make first rate mortar the mass should be worked and pounded like putty. Sometimes mortar is made a year before being used.

INDIAN HEMP.

Mr. Nathan Harding, Lakeville, N.Y., says that Indian hemp will make as handsome thread as flax; that it is perennial, and that its roots spread like *Asclepias tuberosa,* and that it grows upon wet land five feet high, and he believes it might be made a profitable plant for cultivation.

AN APPEAL FOR THE FORESTS.

Mr. Jesse Harrington Medina, Ohio, makes an earnest appeals to Americans to save forest trees from total annihilation. He says:

"The reports of the proceedings of the Farmer's Club as published in the *Tribune* is worth twice the cost of the paper. I have been greatly benefited and gratified in reading the instructions relative to cultivating trees and vines. Suffer me to plead a little for the forest. No man who loves his country can help feeling pain at the wanton destruction of our once noble forests. The once fertile districts of Asia Minor have been rendered almost desert by the destruction of the forests, which have been gradually destroyed since the irruption of the Tartan hordes from Central Asia, and our forests are being destroyed by more than Asiatic barbarism, for the Tartars only destroyed the timber as they needed it, and left their sheep and goats to do the browsing, so as to prevent the timber from growing, and it has taken several hundred years to denude the mountains of their covering, but this has been done to a great extent in our country in less than one century.

"Many a Western man who, like myself, has traveled through Kentucky and Tennessee to aid and minister to wounded or sick sons, has observed that the older settled portions of those States, particularly the blue grass region of Kentucky, is now nearly destitute of timber. The land was cleared at first far closer than it should have been, and has been pastured since, woods as well as other fields, while the timber has been used as wanted, until what they now call woods will not average ten trees to the acre. I was painfully impressed during my last visit to Vermont (my much loved native State) to see the apparent determination to destroy what remained of their forests. Sheep seemed to be king, and land that would not keep more than two to the acre was being stripped of timber for their accommodation; while, at the same time, if the sheep had been kept off and the wood suffered to grow, (as it sells readily there now and grows quickly), there might be five times the value sold off in wood as the pasture was worth. Mr. Cotton, of Hartland, speaks of the deterioration of the pastures of Vermont. This is very plain, but the remedy is not as easy. The woodlands have not, as a general thing, been fenced, and the sheep have lain in the shade when they were not cropping ; and, consequently, the manure has been, to a great extent, taken to the woods and ledges, where Mr. Cotton has seen it in piles one foot deep, which is sufficient to make any country poor. And more than this, the pastures have generally been heavily stocked, so that such grass as the sheep loved has been eaten so closely that it has never been allowed to seed, and wild, bitter grasses have taken its place. This will account for the poverty of the Vermont pastures, without looking after wool, hides, horns, bones or anything else that has been taken away by the drover or butcher, as the manure taken off would amount to a thousand times the value of all of these substances."

SUMACH DESCRIBED.

Mr. Andrew Benner, Summerville, Maine, says : *Rhus Coriaria* (Currier's Sumach) I have seen growing as far south as the Rio Grande, and as far north as Madawaska ; it is common everywhere in dry rockly land. I have seen the Indians in Texas smoke the dried leaves as a substitute for tobacco. Never heard of it being used as a substitute for Oolong tea until I saw the subject discussed in the columns of The Tribune. The Penobscot Indians make tea of the fine green boughs of the Hemlock, steeped in water, which makes a pleasant and agreeable drink.

Rhus Toxicondendron, or poison sumach, called in Maine, New Hampshire and some parts of Massachusetts poison dogwood, grows in wet ground, and is not easily mistaken for the other, and does not grow in the eastern part of this State.

Mr. Wm. R. Prince.—There is a confusion of names and a good many errors prevalent about this plant.

I noticed in your proceedings of last month a description of the sumach and the different species of it, and wish to present some information on the subject. The introduction and culture of the Sicilian tanners' sumach of commerce the *Rhus Coriaria*—was an object of an anxious interest with my father more than fifty years ago. It was in his attempts to import the *Rhus Coriaria* that the Chinese alianthus was introduced, as it was sent to him by a London nursery as the tanners' sumach of Sicily. After utter failure in obtaining it from any English nursery, my father finally obtained it from Naples, (Sicily) by a ship belonging to Gardner G. Howland of this city.

My father wrote some articles, urging its culture upon our countrymen, but they did not seem inclined to engage in its growth, and the attempt failed. I, myself, again urged its culture upon our countrymen, by a pamphlet, in the year 1854; but the people seemed to think that our common Sumach would do as well, and the attempt again failed. There is a very great superiority in the tannin quality of the Sicilian Sumach over any American species.

TANNER'S SUMACH.—RHUS CORIARIA.

The trees that bear this title are the *Rhus Coriaria*, of the south of Europe, and *Rhus Copallinum*, of our own country, the latter bearing greater similitude to the European species than to any other of those which are natives. The European species cannot be cultivated with success north of the Potomac. It is therefore to the American more hardy and more vigorous species, that we must look for successful cultivation in the Northern, Middle and Western States. It is found from Massachusetts to Carolina, growing vigorously on the banks of ravines, on the uplands adjoining swamps, and sometimes in sandy woods. Considerable quantities are annually collected in some parts of our country; but the amount is so limited in comparison with the great demand, that several hundred thousand dollars are paid each year for the imported article. Will not some of our enterprizing citizens engage in the extensive culture of a shrub so easily grown on our least valuable soils ?

The propagation of both the European and American species is by seeds, or by young trees two or three feet in height. The former attains at full growth a height of four to five feet, and the latter eight and sometimes ten feet.

The best of all the American species for tanning purposes is the *Rhus Copallinum*. It forms a small tree of about eight feet in height, and is readily distinguished from others by its light gray bark and slender branches. The clusters of seeds are small. The Sumach, so common along road sides and on the edges of swamps is the *Rhus Glabra* and not *Rhus Typhina*, as Mr. Fuller erroneously told you. It is a shrub and not a tree, and the usual height is four to six feet. It is the most conspicuous on account of its large red clusters of seeds. It cannot be mistaken for any other. This is the species whose leaves have been recommended for tea.

The *Rhus Typhina* is a tree, and attains to a height of fifteen or twenty feet, and the clusters of seeds are not half the size of the preceding. It is never found in the highways like the preceding, but is found on the borders of woods and along neglected hedgerows bordering our fields. The three I have named are the most common in this section of our State, and of these the *Copallinum* is the only one of great importance for its tanning quality. The course of propagation should be by seeds, which are produced in considerable quantities.

I noticed some confusion as to the poisonous species of Sumach, in the remarks made here at the November meeting. There are five species which are venomous. One of them is a tree of much size, with large and beautiful foliage, greatly resembling an ash tree. This is the *Rhus venetata*, of Torry & Gray—the *Rhus vernix*, of Pursh & Michaux. It is usually called poison Sumach or poison Ash—the foliage takes a beautiful red hue in the autumn. The height is from eight to fifteen feet. The leaves and sap are exceedingly poisonous. It is this tree which Mr. Fuller confusedly describes as *Rhus toxicodendron*, and of which he said a tea made of the berries is often taken for diseases of the throat; a person who drank this tea would never be able to use his throat again. Its leaves, if even pressed in the hands, imparts a most venomous poison. This tree is a precise counterpart of the fabled Buon Upas of Java, the *Rhus javanicum*, whose juice has been used in that island to poison their arrows, and in regard to which we have such fabled tales touching the treatment of their prisoners of war. The *Rhus toxicodendron* is not the poison Sumach tree as Mr. Fuller told you, or is it rare as he stated.

The *Rhus toxicodendron* is a climber or vine, and is the poison Ivy of our swamps, woods and hedges, and found everywhere. The *Rhus pumila* is another poisonous species, a native of the Southern States. It is a diminutive shrub. The *Rhus diversiloba* is another poisonous dwarf vine, which grows plentifully under the Live oaks of California, and is also found in Oregon. The *Rhus aromatica* is a pleasant, fragrant leaved shrub, found in Maryland, and South to Georgia. We have, besides, the *Rhus laurina*, of California, and the *Rhus trilobata*, of the Rocky Mountains, and a species in Arkansas that greatly resembles the *Rhus cotina*, of Venice, which latter is our common Purple Fringe tree, grown in our yards and gardens.

On motion of Professor Mapes the remarks of Mr. Prince on the Sumach were ordered to be entered on the minutes of the Club.

On motion the committee to report upon the leaves of the Sumach, as a substitute for tea, was discharged from any further consideration of the subject.

Cultivation of Licorice Urged.

Mr. Wm. R. Prince urged the cultivation of licorice, and described it as follows:

"Licorice"—*Glycirrhiza Glabra—Diadelphia—Decandria.*—The licorice is one of the most important of the plants that are destined to be added to American agriculture, and it merits at our hands an early adoption, on account of the facility of its culture, its great usefulness for various purposes, and the large profits it yields to the cultivator. When the highpriced lands of England and France are profitably devoted to it, how much more lucrative must it prove where land is plentiful and cheap, and where, above all (as is the case in several of the Western States), the soil is naturally permeable, free from stones, and no manuring required. It is indeed mortifying to American pride to witness the many thousands now annually paid to Europe for an article like this, so simple in its culture, that we ought to be the largest exporters of it, thus adding another item to our *Granary of the World.*

"The licorice is a deep-rooting perennial plant, of the *Leguminosæ*, the roots creeping to a considerable distance. It has herbaceous stems, four to five feet high, with composite dark green leaves. The flowers, which are blue, come out in axillary spikes during July and August. It has long been extensively cultivated in Spain, and since the commencement of Queen Elizabeth's reign, it has been largely grown in various parts of England.

"The soil for the licorice should be a deep sandy loam, or other light soil, and be trenched by the spade or by a subsoil plow, or by the aid of both, two to two-and-a-half or three feet in depth, and well manured. The light permeable soils of our Western States, which are enriched by nature, are the soils pre-eminently suited to the most profitable culture of this plant.

"The propagation is by cuttings of the root, and usually the small side roots are taken for this purpose, and made into cuttings four to six inches in length. The planting season may be either autumn or spring, as most convenient. The cuttings should be planted in rows, two-and-a-half to three feet asunder, and at the distance of eighteen inches in the row. During the first season, the plants do not attain a height of more than a foot, and the space between the rows may be used to grow onions, lettuce, beans, or similar vegetables. Keep the ground free from weeds, and, after the subordinate crop comes off, hoe and dress it well, when for economy, a horse-hoe or cultivator may be used. During the second season a crop of vegetables, covering less width than the first, may be grown, each year allowing additional space to the increasing stems of the licorice. Every autumn the haulm should be cut and removed after it becomes withered. As this plant spreads its roots rapidly in every direction, they will form a complete mass, yielding immense crops.

"At the end of the third summer's growth the roots will have increased so as to be taken up, which is usually done by commencing at one side of the field and trenching over the ground. The roots can be immediately sold to the brewers, distillers, druggists, and other consumers and venders; or they may be preserved in sand till wanted for use. If, however, they are intended for transportation, they should be dried and tied in bundles.

"Licorice is used very extensively in brewing porter, and in medicinal and various other preparations where saccharine matter of this description is desirable."

Grape Growing and Wine Making.

Mr. John G. Bergen.—I have been much pleased with the letters of Mr. N. C. Meeker, Dongola, Illinois, and think them the most interesting I have ever read on the subject, I hope they will be preserved in the proceedings of the Club.

Mr. Solon Robinson.—I fully agree with Mr. Bergen, and hope the Secretary will attach them to the report of this meeting.

MR. N. C. MEEKER'S LETTERS.

I have undertaken to furnish three letters on raising grapes and making wine. That this might be done with advantage, I have visited vineyards around Cleveland and Cincinnati, and in Illinois and Missouri. What I shall have to say will apply to that part of our country west of Pennsylvania and New York, though much will be common to all sections. The facts I have gathered will be useful to beginners; skillful growers will find some of them new—they will decide whether they are true.

Some time ago I thought of writing against making wine of grapes—now, after reflecting and careful examination, I write in favor of the object. Some of the reasons are: many men seek stimulating drink with the rage that a tiger seeks blood. Drink they will. The children of such inherit this taste. It is better for them to have the gout than the delirium tremens. Young persons are led astray—they drink and fall to rise no more. It is fashionable, it has been thought not hurtful, to drink wine. The wine of the saloons, the grog-shops, and the hotel tables, is worse than the whisky of which it is the basis. There is no doubt that in drinking it millions have been ruined. So long ago as in 1780, Marmontelle, in his memoirs, relates that an Archbishop whom he names, when getting a supply of wine, went himself to the press and selected the grapes; he saw them mashed and pressed, he furnished casks into which the wine was put, then he had them put into wagons which he could lock up, and he kept watch of them by day and night till they were placed in his own cellar. If this was necessary then, in order to get pure wine, what is required now? Simply that farmers should plant grapes, and that wine be plentiful. I candidly believe it can become as common as cider. It is vastly easier to make a temperance man of a wine-drinker than of a whisky-drinker, because there is a basis to work on. Reforms come by degrees. First, one step, then another step; never many steps at once. The temperance movement has resulted in making beer-drinkers. Next let there be wine-drinkers. When this habit shall be removed, it will be last in the series of temperance reform. Perhaps, if not quite successful in this, no harm will be done.

We must take the mass of mankind as they are, not as we wish them to be, or as a few of us may be. I do not believe that if we have a plenty of pure native wine we will be inclined to abandon it for whisky, any more than I believe we will abandon good for poor food. Wine drinking, as I propose it, is wholly unknown in this country. I have no confidence that a glass of pure wine can be obtained simply by asking for it, either in New York or London. In Cincinnati it is notoriously drugged. I think I can show how almost every farmer may have barrels of pure wine in his cellar, and at a little expense. Let us remember that we have free schools, that the sciences are enlarging, and that the human brain itself is expanding. A vast, rich and wonderful country is ours. The Arabian Nights does not speak of any country so desirable as ours. Every one who treads this soil should be proud that, even in a remote degree, he shares in this wealth, and that he is able to contribute to our shining destiny.

Eighty-one miles from St. Louis, on the southern banks of the Missouri river, and in the county of Gasconade, is the town of Hermann. It contains about 2,000 inhabitants. Two series of hills, scarcely more than a quarter of a mile apart, inclose the town, and they terminate in bluffs, at least two hundred feet high. These have been cut down to give a passage to the Pacific railroad. A street fronts the river; a street runs back from the river. At the end of it there is a hill. On approaching the hill one sees another street open at a right angle, with another hill at the end. Turning at the foot of this hill is another street, and all along are stores, churches, a market, and nice residences. At last the country opens a little; there are more hills and valleys, and one sees farm-houses, some in lofty situations. Meanwhile, one sees in gardens and yards, on the hill-slopes and tops, grape vines, or the stakes to which they are tied. The hills around Cincinnati are high. Could you place other hills equally high on their tops you would have such hills as are at Hermann.

In this little town are only two citizens American born. The rest are Germans, mostly from Saxony, and this county is settled mostly by the same people. They are all for the Union. I seldom find a fruit-grower who is a secessionist. There were only forty slaves in the county when the war commenced; where they are now it would be hard to tell. Most of the people speak English, some quite well. They seem interested in only two subjects—grape growing and the war. They see, they desire, no way to end it but by tearing up slavery by the roots.

Mr. George Husman, who recently was one of the Missouri delegates to Washington, took me in charge. He has a large nursery and is an extensive grape-grower. After visiting his fine orchard and vine-yard, on the bluff below the town, and tasting of his wines in his large wine cellars, we mounted two gray horses on our way to visit other vineyards. We went into the town and out through its zig-zag streets. First, we came to the vineyard of Mr. Poeschel, lying on a hill-slope. It is an improved one of his own planting, being of Norton's Virginia. In 1847, he planted seven acres of Catawba, which variety he has abandoned. So have all the other vine-growers in Missouri. They say it is not worth so much as the Virginia, even if it does not rot.

The Norton's Virginia vine is vigorous, hardy, and productive; starts two weeks later than the Catawaba; ripens two weeks earlier, hence valuable for low grounds; bunches medium, compact, sweet and rich; moderately juicy; makes an excellent dark red wine; subject neither to mildew, leaf blight, nor rot. Its small size does not fit for a table grape so well as some other kinds, though for one's own use it is good enough. When it was first planted here they inquired of Mr. Longworth, who was authority in all such matters, as to its value; he replied that it was worthless. This discouraged many, but not all. Before Mr. Longworth died he changed his opinion, and sent hither for a stock of vines.

The vineyard I was speaking of contains about four acres, set out 6x8, and trained on trellis, that is, posts 7 feet long and 5 feet above ground, are set 10 feet apart, and three tiers of bail wire stretched from post to post, by turns around strong nails. Wire is considered cheaper than slats. The vines are tied with twigs of golden willow. This is quite different from the Cincinnati method, which, briefly, is to plant thicker to tie to single stakes, and to dwarf the vine. I saw very few grapes at Hermann, tied or trained in this way. In fact, I do not find a similarity of treatment in any two places I have visited.

Adjoining this vineyard some two acres more were in preparation for planting. To describe this is to tell how grape-growers generally through our country perfer the work should be done. It is also the German and French method. A likely negro was at work trenching. Commencing on the lower, and throwing out the dirt on this side, a ditch two and a half feet wide or more, or less, and two feet deep is dug across the future vineyard. Where possible, Mr. Poeschel prefers to put brush, straw or rotten wood. Bones would be very good in the bottom of this ditch. A similar space next this ditch, is dug next; the dirt is thrown into the first one, with the top soil at the bottom. Into the next vacancy more brush, &c., is thrown, and in this manner the work proceeds till the whole piece is dug over, and the work is finished. Dr. Shroeder, of Bloomington, who has three acres, digs ditches 2 feet deep and 2½ wide, leaving a space of 3 feet wide undug. Mr. C. Fell of the same place, also Mr. Phœnix, and Mr. Coleman of St. Louis, plow as deep as possible, and then come with a sub-soil plow and four horses, and in all plow from 17 to 20 inches deep. Some at Cincinnati plow, particularly if the soil inclines to sand, but for the most part they trench. At Hermann they have 500 acres in grapes, all of which they have trenched. They will put in next spring 100 or 200 acres more. The trenching, or plowing, is done in the fall, and the planting too if possible, but either may be done in the spring, if there is time. I asked the negro what he thought of this kind of farming. He said, "Truck orter grow powerful well, but his master wouldn't have no sich nonsense on his plantation." Naturally, I asked him where he came from. He told me he came from near Lexington, that he run away, and that at this work he was making 75 cents a day and his board.

To trench an acre of land as described, costs, when labor is moderately plenty, $75, now it will cost $100. I took occasion to ask what would be the result if the grapes are planted on ordinary plowed ground. I was invariably told that the vines would do well three or four years till their roots came to hard ground, and then they would do nothing. Dr. Shroeder showed three rows not trenched in the midst of others that were trenched. The first had made very poor growth, the last looked fine. This, then, seems the condition for raising grapes; whether the ground be high or low, it must be trenched, or sub-soiled at least. When the soil is very stiff and has a sub-soil which will not let off the water, grapes ought not to be planted, though pipe-drainage, thoroughly done, might make it suitable. To all all this there is a limited but notable exception. I shall speak of it in particular when I treat of grape-growing on the Ohio Lake Shore.

To expend so much in preparing the ground for grapes will discourage some. It is more than a farmer ever expects to get in any one year, or sometimes many years, from an acre of land. The trenching, however, is only a commencement of the expense. At Hermann, the following is their account with an acre of Norton's Virginia; with the Catawba it would be a few dollars less, but only with the first item:

1,000 layer roots	$120
Trenching	75
Planting	25
1,000 small stakes for first year, eighteen inches long	4
1,050 posts	84
3,000 lath and nails or wire	18
Labor first year	25
Labor second year	50
Total	$401

It is expected that this $401 will be returned on the third year, or, at least, that the profits will pay expenses. On the fourth year there will be a full crop, as well as all following years. With the grape mentioned they get 500 gallons to the acre, which was selling, new, when I was there, at $2 per gallon. In the spring it will sell for $3 a gallon; but thus far they have had none on hand at this season, so great is the demand.

I know very well that the grape growers of Cincinnati will laugh at this estimate of 500 gallons to the acre. In conversation with Robert Buchanan of that city, who has seven acres three miles distant, he said, that for seventeen years his vineyard has averaged only 200 gallons to the acre, and that it sold for $1.50 a gallon. The following is his account with the seven acres: In 1859, he had 470 gallons; 1860, 3,000 gallons; 1861, 1,850 gallons; 1862, 485 gallons; 1863, 2,164 gallons. Mr. Buchanan is a most trustworthy gentleman, and is the author of a work on this subject, of great value. However, he recommends the Catawba. The reader will be surprised to note how very little wine is made in some of the years mentioned. The reason is, they have the Catawba grape, and some years it is almost a total loss, on account of the black rot. My own vines last year, in Southern Illinois, fruited as much as half a bushel each. About the 1st of July they began to rot, and I did not have a single ripe berry. Except on the Ohio Lake Shore, I look upon the Catawba as wholly unworthy of cultivation. Still, money can be made with it, but I offer this statement in comparison with some other grapes, which are: Norton's Virginia, Concord, Delaware, Herbemont, and Hartford Prolific. Still, all these, except the Norton, have been known to suffer with leaf blight or rot, though in very slight degrees. Mr. Husman places the Norton above all others for a wine grape, but in his little work on the vine, he says that the grape most suitable for everybody to plant is the Concord, and I mainly agree with him.

Now according to our present knowledge, either of these grapes, being mostly free from rot, and the Norton wholly so, is certain to yield, at least, 500 gallons to the acre, and this is not much when they do not rot. Eight pounds of grapes to the vine is not a large yield. I believe the average is nearer ten pounds, it is often 15 or 20; the number of pounds of the different kinds of grapes required to make a gallon of wine was stated to me by many wine makers as follows:

14 lb. Norton's Viginia	1 gallon.
12 lb. Catawba	1 gallon.
11 lb. Concord	1 gallon.
11 lb. Herbemont	1 gallon.
13 lb. Delaware	1 gallon.

The last is not a very certain estimate, because little wine as yet has been made from this grape. Let it be understood that when I mention wine, I mean nothing whatever but the pure juice of the grape. There are mixtures of sugar, spirits and the like; this is cordial, not by any means wine.

Wine from the Concord and Herbemont is not quite so good as that made from Norton's Virginia, nor is that from the Catawba, to my taste, at least, nor does either sell for so much. The great advantage in the Concord is that it sells well in market, and is certain to bring, at least, nine cents a pound, wholesale. Large crops have been marketed at twelve cents. It is manifest that if grapes sell for less than eight cents per pound, it is more profitable to make them into wine, The Hartford Prolific is the earliest of all, is certain to bring 15 to 20 cents a pound, and south of 38 deg. does not drop, north of this it does to some extent.

After making all proper allowances for unforeseen casualties, and cutting down the estimate of the profit of an acre of grapes *one-half*, which grape-growers will call monstrous, with a grape that does not rot, I think it quite safe to say that *an acre*, planted as I have attempted to describe, and well cared for, will, after the fourth year, and during one's natural lifetime, bring in annually the sum of five hundred dollars. I am confident that often it will bring a thousand dollars annually.

There is one other item of no little consequence, and that is the sale of layered roots or of cuttings. From every vine a layer may be had, and for years to come, perhaps hundreds of years, as much as a hundred dollars, at least, annually may be obtained from this source. I remark here that the Hermann folks say the Norton cannot be grown from cuttings, but that the Concord can be. One person told me he could do it, but refused to tell how. I think I divined the secret, and will divulge it when I speak of propagation.

The Hermann folks gave me these two statements: Melchior Poeschul, from one and a half acres of grapes, sold 11,000 pounds at 9 cents, made 70 gallons of wine at $2, and also sold $350 worth of layers—total, $1,490. Another Poeschul, from three acres sold, 1,700 gallons of wine at $1.75. This was last year, and from the Catawba at that.

It has been thought, particularly at Cincinnati, that Americans cannot raise grapes, and that only German vine dressers can succeed. I think this is a great error. It is true that they are Germans at Hermann, but after making many careful inquiries I could not learn that any of the successful growers knew anything about the business before they came to this country. On the contrary, I was shown the place of a regular German vine dresser, who continually prophesied failure on the part of his neighbors—the result was, he always failed, they always succeeded. Many at Cincinnati, I was told, are beginning to see that their German laborers and directors know too little how grapes should be managed in this country. And by the way, the yield of wine, per acre, even at Cincinnati, is from 50 to 100 gallons more per acre than it is in either Germany or France. Some times in these countries there are almost total failures for three or four successive years. It was only after repeated failures that the Romans, in the second and third centuries, succeeded in establishing the vine on the banks of the Rhine. Hence, I do not hesitate to say that the United States naturally, and as a whole, are more favorable for the grape than Europe. The Ohio lake shore is fully equal to Italy, and California to Spain. To this superiority, or, if one chooses, to this equality certainly must be added a more intellectual and progressive people, who, in whatever business they engage, thoroughly search for causes of failure, and ultimately, by scientific and practical methods, attain all the success possible.

Again we mounted our horses, when others joined us, and we go up and over the hills. Few would value these steep rocky slopes, those bold airy pinnacles, with deep gorges on either side, through which the Missouri is seen at times, and yet in almost every field are grapes or men at work preparing to plant them. When I inquired why such high rough ground was considered best for grapes, I was told that the frost is less likely to kill them, which is true, and that this fruit requires nothing so much as a free circulation of air. Before I get through, I shall show that grapes will grow excellently well on level ground. The soil on these hills is surprisingly rich, corn looked well, even better than it usually looks in Illinois, which is saying much, but they cultivate thoroughly, and plow a foot deep, and barley fields were matted with green. This has become a most profitable crop, as it yields from 25 to 40 bushels an acre, and sells now at $1.50 a bushel. Wheat also does well. No where have I seen more thrifty orchards, the pear is a perfect success, and here alone, so far as my knowledge extends, the apricot bears year after year enormous crops of perfect fruit. It sells from six to eight dollars a bushel. Afterward, at one place they gave me some New York pippin apples so large that I could not get them in my over-coat pockets. On the south side of the hills lime stone crops out, where they like to plant the Herbemont; on the north side, sand stone. We reached the top of the hill, where were some twenty acres of level land. A few of the Hermann house tops and church spires were visible. A vineyard and orchards were around us. At the house many hands were at work building a wine cellar. Again the Missouri is in sight, and it stretches ten or fifteen miles to the northwest. It is also below us, fully six hundred feet, or nearly an eighth of a mile. Two large vineyards also lie below, and as if in a deep valley, but they are 250 feet above the river. Hills are on every hand, and on their slopes and tops we see vineyards and grain fields and orchards and houses. At the river's edge the hills terminate in rocky precipices. One hardly hears the railroad train as it hugs their base.

"The castle crag of Drachenfels
Frowns o'er the wide and winding Rhine,
Whose breast of waters broadly swells
Between the banks which bear the vine,
And hills all rich with blossomed trees,
And fields which promise corn and wine.
The river nobly foams and flows—
The charm of this enchanted ground,
And all its thousand turns disclose
Some fresher beauty varying round."

We went down to a white farm house. Everything was neat, if not elegant. There were flowers in boxes and pots, and fine pictures on the wall. The wife spoke a little English. Some of the men did but little better. But I was welcome. After a little we went down to the wine cellar. When one moves here he goes down or up. Fancy a large railroad culvert 35 feet long, 24 broad and 15 high, walled across one end, where are two flues for ventilation, and which is reached by a passage or entry eight feet wide, through two strong doors, and you have a wine cellar. Over this cellar is a building which looks like a barn ; in this is the wine press ; a pipe and a hose lead through the top wall of the cellar into the casks below. The cost of these cellars is from $250 to $500. Nothing, whatever, is kept in them except wine. The casks are on each side ; one walks between them. They are of various sizes ; few smaller than a barrel ; many hold 600 gallons, or 20 barrels, and cost from $50 to $60 each.

A tumbler was at hand, and wine was drawn from a cask near the top. I took a few sips and handed it to the one next me. It was about a month old. It differed in taste from the wine I used to drink. At first it had the taste of good cider, then came a bitter flavor, and then that of the grape itself. It was dark red and clear, and made from Norton's vineyard. Their largest stocks are of this kind. Another cask was tapped, and the glass handed me. This was the same kind, but made a little differently. I called it very good. They then tapped another cask, and the glass came round. This was the Concord, and excellent. Still another cask was tried. I thought I had enough, and told them so, when they uttered a storm of good natured words, informing me that I had drank nothing, and that easily I could take two bottles. I tasted as before ; they said I was not taking my share ; they were so kind I did not want to offend them, and took another swallow or so. They were pleased, and tapped another cask. This was the Catawba, a white wine, very good, a little in the hard cider or champagne style, but of the true Catawba flavor. This matter seemed to be going rather far, and I began to count the casks. There were twenty-five. I knew not what would take place if I had to go through the whole, and I told them they had got me in a close corner. They said yes, that there was no help for it, and went on tapping. After a little I began to be one among them, and let them know I could talk German a little. "Ach ! wie sc'on und zart er ist,' said I. "Good," said they. Then came their Herbemont and Cattawissa with variations, and then a kind at first without a name, which was the best of all; it was the Norton, made after the grapes had lain several weeks on straw, and which, in the old countries, is called "straw wine." It requires twenty pounds of grapes, at least, for a gallon.

I do not want to tell any long stories, and I close by saying this business went on a long time. When it came to an end I felt I had come to a good place; still I remember in particular that as I walked away I called myself sober. At dinner, which came next, we had no drink but wine. Such is their custom. It seems to me no harm would be done if it were made a substitute for tea and coffee.

After this we went into the vineyard. It was the Catawba, and was planted fifteen years ago. Here are nine acres, and adjoining as many more. The manner of training is on trellis, though instead of wire there are oak slats. The ground is so steep that there is a terrace every second row, made of stone wall, with stone steps at intervals, the material for which came out of the ground when trenched. The average profit for ten years, excluding two years when there were hail-storms, has been $500 an acre. For several years the grapes had rotted badly. The owner said he had done all the work himself, and added: "I work much, very much." I never saw a stronger, healthier-looking man. I would say the same of almost every one I saw of this class. They have not the least appearance of being intemperate. Striking his hand on his heart, one said, "Wine is good here." On the highest point of this vineyard was a watch-house. At another place I saw some vineyards which were inclosed with the osage-orange hedge. "A certain householder planted a vineyard, and hedged it around about, and digged a wine-press in it, and built a tower."

On our return we stopped where they were making the wine cellar. This man had half an acre of Delaware grapes which I wanted to see, and from it he had made several hundred gallons of wine. His cellar was under his house, and so filled with casks that the wine was drawn up through the tubeing. The testing began again, and the same scene was presented as in the other cellar. Soon we reached the Delaware. I know of no other person in the West who has made wine from it. From so sweet and fine a grape I did not expect a wine so much like Catawba, and so strongly vinous. It seemed to me inferior to that made of the Norton Virginia. I do not pretend to be a good judge. It will require some time for us to have good judges of native wine. Old wine judges have based their taste upon foreign wines, many of which, if pure, have a flavor of goat skins. It may have this flavor if it is not pure. For a certain sum a book can be had in New York which will teach one how to make whisky taste like every kind of wine and liquor.

I looked at the Delawares in the vineyard. They showed their character of short joints and light-colored wood; they are nearly as strong as the Catawbas. Frequently, during my journey, I was shown some of Dr. Grant's five-dollar Delawares. Some of them had not grown four inches in as many years. But here they look well. I have some myself which grew three or four feet last year; others look as if they might live. I am convinced that the reason why there has been dissatisfaction with this variety, is because nurserymen, in their eagerness, have propagated from eyes of *immature* wood. Such vines never will grow. A plant is just as good when grown from an eye, if you give it time, as from a layer. But the wood must be ripe.

It seems to me that these hills of Hermann will become a fashionable resort for the ladies and gentlemen of St. Louis, and other cities. Let there be places of entertainment, where wine and pears and peaches and apricots can be bought, and at points where views of the beautiful scenery can be obtained, and a ride on horseback from the town will be delightful. Nothing along the Rhine can excel it. On other rivers, in other States, are locations equally good, some are as beautiful. So far as I saw, the State of Missouri, as regards soil, is superior to that of any Eastern State. Several leading men at Hermann told me it would be a great advantage to them if enterprising Americans were to settle among them. Improved farms, near the town, sell from $20 to $30 an acre. In various parts of the county they can be bought from $5 to $10 an acre. There are no vineyards on either. An acre in grapes ready to bear is valued at, and sells for, $1,000. It is richly worth it.

At St. Louis I found Mr. Coleman, editor of the *Valley Farmer*, busy in propagating Norton's Virginia, as well as other sorts. In his nursery grounds, five miles from the city, he showed me a great variety of grapes which do well. He says that grapes grow well near the city, on old worn out fields. The preparation is to plow twenty inches deep. For wine he recommends Norton's Virginia; for table grapes, first, Hartford Prolific; second, Concord; which he would plant ten feet each way, train on trellis, and cultivate by mulching. He speaks well, as did others, of Dr. Grant's Iona. He says the grapes growing there are far larger and sweeter than when grown further north. Land adjoining him sells for $500 an acre.

At Des Moines, Iowa, James Smith, long, largely, and successfully, has propagated the Concord grape, and, so far as I know, has been most instrumental in giving it notoriety in the West. He has always raised good vines, some of which, if permitted, would bear the first year. At various places on the Mississippi, particularly at Warsaw and Quincey, grapes are doing remarkably well. Much was attempted, some time ago, at Nauvoo, by a French colony, Foreigners never have succeeded in this business in our country, where they cling to European methods. The experiment of the Swiss, at Vevay, Ind., was on a large scale, and a failure. Almost everywhere on the Upper Mississippi, grapes are doing well. Various parties have fine success in the Rock River Valley, in Northern Illinois, near Wisconsin. Here all kinds of grapes are reported to succeed, and the Delaware in particular. The soil approaches sand, with a deep subsoil of shale or of gravel. It is known as hazel land.

It is important to know what success attends grape growing on the prairies, which occupy so large a portion of this State, a considerable of Indiana, Missouri, Iowa, Minnesota, Nebraska, and Kansas. This is a wide region, and one must travel and observe much to be able definitely to make a statement which will apply to the whole. There is reason to believe that Illinois contains every variety of prairie, as well as of timber soil, common to the region named. To tell how grapes do here will indicate how they will do in similar sections.

In the heart of the black-soil prairie region at Bloomington, grapes have been thoroughly tried. Dr. Schroder has four acres; Mr. K. H. Fell an acre;

Mr. Phœnix five acres, though not in full bearing, and is preparing to put out as much more; also, Messrs. Overman & Man; as well as some other parties. In all, there are about thirty acres. Dr. Schroder, a German, has given his vines great attention; trains them on trellisis, and is successful, even with the Catawba, though they rot with him, as elsewhere. It seemed to me that his situation is not most favorable; the ground, though slightly rolling, is bordered by a slue, and there is higher ground in the vicinity, though such a thing as a hill is nowhere near. He trenches two feet deep, but only two and a half feet wide where he plants. For experiment he has all the various kinds. He does not speak highly of Concord or Hartford Prolific. I do not remember that he praised the Delaware, for he showed some of the vines four years old about three inches high. He showed two rows of Catawba, planted on ground not trenched, which were poorer than any of the rest. He plants 4 × 6, and has strawberries between the rows, which be will take up because they injure the vines. Every one of experience says nothing but grapes should grow in a vineyard.

Mr. Fell has 1,500 vines of the Concord and Hartford Prolific, and is preparing four acres by plowing from 17 to 20 inches, when he will plant one-fourth Delaware, and the rest of the sorts above named. Last year, his Hartfords averaged eight pounds to the vine; a few bore as much as 20 pounds, and sold for 20 cents a pound. They are planted over a brick drain, and grow on trellisis. The Catawba is very uncertain with him. Of the Delaware, he says thousands of roots are sold which are worth nothing, owing to excessive propagation, but knows good roots can be raised.

Mr. Phœnix is largely interested in grapes. He is a nurseryman, as intelligent and enterprising as any of his class. He has neighboring competitors not far behind him. With from 50 to 200 men in constant employ, 160 acres in apple trees, as well as additional ground of other stock, he has need of having his eyes open and his wits at work. And yet, he is in doubt whether the Delaware, the best of all our grapes, is going to be trustworthy. He calls it his study night and day. He gave me his experience; it is candid, instructive, covers the whole ground, and ought to be his own answer.

Everybody wanted Delawares. He had several thousand. So soon as the vines made what was thought sufficient growth, he ordered his men to layer them, then, as they extended, and as laterals pushed out, they were layered, and thus, through the whole season, everything that could start a root was smothered. The best of these were sold—that some were fair roots I know, for they grew with me from three to four feet last year—the rest were set out the next season, but did not grow very well, and in the winter great numbers of them died. This process, with the same results, went on several years. Last summer he made a visit to the vineyards on the Hudson, and in particular, to that of Mr. Mace, at Newburgh. Here, he was struck with the sight of the Delawares. The grove was clear, the vines were trained to stakes, even the tendrils were pinched off; they looked stocky, and fruit was abundant. Immediately he wrote home to have his own vines tended in the same manner; when he returned, he had been obeyed only in part—he saw to having it done, but the season had advanced, and he must wait another year, or till the vines can recover. A great many nurserymen have had, I doubt not, the same experience. The vines they have sent out have proved very unsatisfactory; and it seems that this is to be said of the Delaware, that so long as this constant smothering, as well as raising roots from eyes of this same wood, goes on, nothing good can come of the vines so propagated. The simple requirement is this the stock from which new roots are to grow must be *from fully ripened wood.*

In the yard of Mr. Green Miller, in the suburbs of Bloomington, I was shown three vines of the Hartford Prolific, a grape not first quality by any means, but it is earliest of all, or, none are earlier. The account of these vines ought to set people thinking. They were obtained from Mr. Phœnix four years ago last spring. They were planted to cover an arbor ten feet wide and thirty feet long. Two or three other vines were planted with them. Mr. Miller told me he dug holes about two feet square, put in bones, old shoes and such stuff, and covered without much care. In the fall he puts two bushel of stable manure as mulching around the roots of each vine; in the spring he takes it off and spreads it on his garden. Last year, and previously, he pruned them, according to his limited knowledge, but a German vine-dresser said he would have no grapes because he pruned wrong. This, the fourth year, they bore a full crop. I visited Mr. Miller in his store and got his account. He seemed a very candid man, and I can imagine no reason why his statement is not trustworthy. Besides, I had a similar one of these grapes from the neighbors. He said that they had all they wanted to eat and to make into preserves ; that they gave some away, and that his wife sold some ; in short, that from these three vines there must have been five or six bushels. On my expressing surprise, he said he counted the bunches on one vine, just for curiosity, and there were four hundred and twenty, and, it would seem that if they had been sold at the market price they would have brought more than fifty dollars.

From this we might conclude that one good vine, if it have room, and is moderately cared for, is worth twenty or more vines planted thickly, and dwarfed to death. The Catawba is a native of North Carolina, so said, and yet is found growing wild in Tennessee, and even up the White and Arkansas rivers, in Arkansas, where it bears abundantly, covering forest trees with fruit. In its native State no one hears of its rotting. Is it not about time to consider the old Roman method of pruning, handed down to our day, as having some defects ? Let every one judge.

Mr. L. Dunlap, at Champaign, fifty miles east of Bloomington, is also preparing to plant grapes largely. Last summer I saw his vines ; they were treated in true nursery fashion, the laterals making roots, and the rest of the vines lying about in a way that would distract a vine-dresser. And yet, notwithstanding this treatment, almost every variety of sufficient age was loaded with fruit, and no rot apparent. Perhaps Mr. Dunlap's vines and trees have a partiality for him, for I saw very small apple trees bearing so much as to seem all apples. In planting 1,000 vines he proposes the following division : 100 Diana, 200 Delaware, 100 Catawba, 100 Isabella, 50 Concord, 200 Norton's Virginia, 100 Herbemont, and 50 new sorts. He prefers the mulatto to the black prairie soil. He thinks the Diana has been overlooked, that the Delaware must be one of the best for some parts of the State, and, with special manures, for all parts. Should Mead's seedling prove what it is claimed, it must be the grape. This is so similar to the Catawba that judges cannot tell the difference, and all the difference claimed is in the vines, which do not rot and will not grow from cuttings. He thinks the Concord and Hartford desirable at present; that in time they must give place to better ones. In planting, he would not trench, but would subsoil a foot deep; set six feet each way, and train on trellisis. He thinks it important that only one shoot should grow the first year, and that it be tied to a stake, particularly the Delaware.

The prairie soil of Illinois is of two kinds, one as black as coal, the other much lighter, and it is divided by a line running east and west in about 39 degrees 30 minutes. North of this line it is dark. That on the south has been called the fruit region. Properly the fruit region is timbered, which extends eighty miles north of Cairo. Here are a succession of hills, many of which, of late years, have been planted with peaches. Some have raised grapes, and most kinds have done well, but the Catawba, under the Cincinnati treatment, is a nuisance. If grapes grow best or well, on hills, there are awful hills bordering on the Ohio and Mississippi rivers. They are fully equal to those at Hermann, and the soil is similar. In the towns, on the light prairie soil, grapes do uncommonly well, but they are in thick arbors. Almost all kinds of grapes when dwarfed, rot in Southern Illinois. There is good reason to believe that grapes require more foliage in a warm than in a cold climate. I doubt whether leaves enough to shade them will hurt them in any climate.

I could not visit all the vineyards at Cincinnati, for they have 3,000 acres. Here first the Catawba was cultivated; it is their staple vine, and it is hard to make them believe there is a better. Mr. Mortier, a German, has, perhaps, the best vineyard. He has good success. He is largely engaged in propagating the Delaware, still is in doubt whether it is equal to the Catawba.

I have mentioned Mr. Buchanan's vineyard. He says that after the first few years of planting, the Catawba does well; when six or seven years old it begins to rot; hence it will take this time, at least, to test a new variety. Their success is various in different vineyards. Mr. B. said that last year some with fifty acres did not do as well as he did with seven acres. Bear in mind that all the vineyards around Cincinnati have been trenched two feet deep. He has come to the conclusion, after many years experience and observation, that they plant too thickly and prune too close. He thinks that the rot is caused by a sudden change from heat to cold; that the vine takes cold and becomes diseased. I believe all careful observers have concluded that the rot follows a change in the weather. The greatest drawback they have is a want of labor. Grapes need manure; that from the stable is good; ashes are best. Too much manure gives an unhealthy growth on sandstone soils; lime is good; here grapes rot less than on limestone. If he were going to plant a vineyard he would put two cuttings where he would have the vine grow—he would trench or plow twenty inches deep; if there is a gravel subsoil, common plowing will do. He is certain the roots descend three or four feet at least. All grapes rot with them, but none so bad as the Catawba. Thinks Norton's Virginia will make a valuable red wine; but a white wine, such as the Catawba, sells best. When I told him the Virginia brought twice the price of the Catawba at St. Louis, he said it is because it was something new. He said that vines having half a dozen bunches are just as likely to rot as if they were loaded. Sulphur in greenhouses is a preventive—in the field it is useless. Volcanic regions are always good for grapes. Such are the notes I took from Mr. Buchanan. He is the author of the best work on the vine in this country. It needs a new edition, with his conclusion about close planting and pruning inserted. I know of no work on the vine in this country which is satisfactory. Mr. Husmann of Hermann has a valuable pamphlet. The Agricultural Report of the Patent Office, for 1861, contains much that is very valuable.

Mr. J. Williamson has a vineyard of 17 acres at New Richmond, Clement Co., some twenty miles above the city. He has a wine-house in the city for the purpose of selling his own wine. I find it has a first rate reputation. He also makes Catawba brandy, which ought to be valuable. I might call it first quality, if I were to judge. Some of Mr. William's views struck me as sound. He says Norton's Virginia does well in that region, and that it will make excellent port wine. After long experience he has become opposed to the system of pruning as established. He would let the vine grow pretty much as nature designs, and that there may be shade for the fruit, in which case it always is sweetest, and that there may be room for the sap to circulate. He would, however, keep the vine within certain bounds. During the summer their German vine-dressers go through the vineyard and tear down the laterals with harsh jerks, and make quick work. Of course, many of the eyes are injured. I believe they call this business "kiteing." Mr. W. had a bitter experience, which I give. On his place he had a fine arbor of Catawbas. It was the pride of the place. It bore well; he would have it do better. He set a German to work at it; he spent two days in getting it right. Then there was great lamentation among the women; their arbor was destroyed. This was several years ago The vines have not done any good since. He says, decidely, a vine must be treated in a uniform manner, or it will be ruined. It will not do to make a dwarf vine run on a trellis, nor to dwarf one which has been extended. As it has been trained the first four years, so should it ever afterwards be trained. "Train up a vine in the way it should grow, and when it is old it should not depart from it." Mr. W. gave an instance of a German at Sandusky who pruned close, and whose grapes were the only ones in that region which rotted. The German said the ground was too rich. Does it not seem that the richer the soil is, the more room in and out of the ground, does the vine require? Does it not seem that in pruning, particularly in the summer when the sap is abundant, that the fruit receives more sap than it can possibly use, and that it is the sap more than the grapes which rot? There is no grape which makes a more vigorous, overwhelming growth, than the Catawba.

Among others, I visited the grounds of Dr. Warden at North Bend, 14 miles below the city. He was not at home; he had expected me, but I was delayed by the trains. His son politely showed me everything. The farm consists of 300 acres, and cost a few years ago $50 an acre. It is a part of Gen. Harrison's old farm. From a field back of the house we could see, in a deep valley where the General had a grist mill and distillery. The house in which the General lived was burned down, and his grave is on an adjoining hill surrounded by evergreens. The fields looked worn out. I saw no clover growing. I did not see any farms in that vicinity which showed good farming. I was struck with the great number of stone chimneys in the fields. The settlers here are mostly from Virginia, particularly on the Kentucky side. Secesh are plenty there. It is to be hoped that we have had the last of Virginia farming, and Virginia politics. Mrs. Harrison lives four miles below with her son, or son-in-law. She does not receive visitors. She is the strongest Union lady in that region.

Dr. Warden's vineyard is in fine condition, and yet the grapes rotted badly this year. Everything is in the finest order, and the fruit trees are thrifty, and in great variety. One sees thence many miles of the Ohio. The house stands about three hundred feet above the water. As a fruit farm, the Dr.'s place is but a few years old. Of the Delaware, I was told they did not like it so well as the Catawba, because being sweet, they can eat but few of them. They showed me some of Dr. Grant's five dollar Delawares. I could see them. They looked like dried smart-weed, and very poor at that. I find many similar vines of this variety from many other sources. They told me what I had never heard before, that is, that their dogs eat grapes, and they eat them as readily as a hog eats corn. Almost every one I have inquired of thinks it would be a good plan to hedge a vineyard with evergreens. Besides the protection, it would secure a more equal temperature. It might prevent rot.

On the whole, vineyards have been successful at Cincinnati. They say they will do well enough, if the rot does not take more than half. They have expended much money and labor, and the country owes Mr. Longworth and others a debt of gratitude. And yet, I cannot help thinking that there are many places more favorable for grapes than here. Mr. Longworth thought the soil on the Kentucky shore better. It is strange how people always have hesitated to bestow labor and to make improvements on slave soil. It was prophetic wisdom. On almost all the Cincinnati hills I saw many small pieces of limestone, and opposite Gen. Harrison's house the soil is filled with very small shells. Shall we, or shall we not, say that a limestone soil is not so favorable for fruit as a sandstone soil? A volcanic soil is always good for vines. The soil of Italy is mostly volcanic and sandy. Such, also, is the grape region of California and the Madeira Islands. In the Azores, they have no stakes to their vines, but keep them erect by piling up blocks of lava, on which the grapes lie.

What I have related of the three vines of Bloomington would lead one to think that the prairie soil is most excellent, if not superior, for grapes. I know that it is a solitary instance, but I see no reason whatever why any one else may not do as well. I think that success on the prairies will turn upon giving the vine room, so that it may have branches to correspond with the great mass of roots which a soil of such wonderful fertility is certain to produce. If this position is true, no one can estimate the value of the prairies for grape-growing and wine-making. The time may come when, in many sections, a bucket of wine will be more easily obtained than a bucket of water. We are only beginning to develop the riches of our country. Clearly it is a superior race which is doing it. For two hundred years, California was known by the Spaniards. The Anglo-American got possession, and in twenty years they have developed more resources than Rome developed in her whole empire during a thousand years. It is good for us to know these things.

Now, if I were called upon to say where grapes will grow best, or where, according to all the light we have on this subject at the present, they will not rot and will prove a most profitable crop, I would say it is on the Ohio Lake Shore. And yet ten years ago they did not know that they would grow there, or there was no thought on the subject. I have no reason to doubt but the southern shores of Lake Ontario and of Lake Michigan are equally good. By the way, it seems to me, that there are as many locations in Michigan as around the little lakes ; on the gravelly hills, and generally, on the ground sandy soil, where grapes cannot fail to do well, and in particular the Concord, for it is earlier than the Catawba.

The grape region of the Ohio Lake Shore extends along the whole length of the lake, and is from three to six miles wide. Why grapes do well is of less consequence than the fact; some give one reason, some another, many mention proximity to the lake—one thing is certain, all rules and conditions which are considered important elsewhere, are overturned and of no importance here. Back from the lake, and usually about two miles, is a gentle ridge, not far from a hundred feet high, or at the distance named from the lake the ground rises to this height, but more gradually. Below the ridge is a strip of sandy soil, from a quarter to a half of a mile wide—next is a strip of about the same width, which varies from sandy loam to thick, blue, greasy clay, and between this and the lake is another strip of sandy soil, rich and easy to cultivate. In some parts strips change places, and clay is found in place of the sand—as, for instance, the blue clay pushes into the lake, and from this excellent potters' ware is made. On the ridges mentioned the soil is clay, in which is abundance of worn slaty ground, though there is considerable variation. In some other places, as above Cleveland, the soil is gravelly sand or even blue clay, and underneath are a species of volcanic rocks, or which show the action of fire, and these form bold precipices along the shore against which the waves dash. In some places it is impossible to get down to the water, which often may be twenty or more feet deep at the foot of the rocks. This is called the iron-bound shore. Such is the general character of this region. So far as I could learn from many inquiries, grapes grow well on all these varieties of soil.

The vineyards I visited are through a distance of several miles east of Cleveland in the county of Cuyahoga. The varieties raised are the Catawba and Isabella. The Cuyahoga originated here. It is said that a gentleman by the name of Whimple was sitting on the steps of a store, one day, and saw a grape vine, the seed of a raisin, come up through the dirt. He carried it home and cultivated it, and this is the origin of the Cuyahoga. Usually they train the Catawba on to two stakes, the Isabella on trellisis. When there is not sufficient air the latter mildews. I do not value it highly. I could not hear of a single instance where the Catawba, under any circumstances, has had the black or any kind of rot. A great many conditions must exist here favorable to this grape. In this county they have about 700 acres of vines. Perhaps half as many will be added next spring. Land is valued at an average of $40 an acre, with fair improvements. In favored localities it is much higher. I saw some pieces on the ridges favorable for grapes, but considerably worn, which recently sold for from $20 to $25 an acre. It is an old country, and one cannot get far from villages. In society full as much attention seemed to be paid to dress as to other matters.

I should not omit speaking of the Islands. They are nearly opposite to Sandusky. Here grape-growers have been remarkably successful, and commenced the business next after they at Cincinnati. Several years ago I was on Kelly's Island, whence so many grapes are shipped to all parts of the country. From my recollection they have a soil of rather stiff clay, and the rocks are limestone. The lime used in Northern Ohio, mostly comes from the Islands. They claim that here the crop always is certain, I have understood, however, that they have been troubled, to some little extent, with the rot. It is certain that the grapes raised here on the shore sell better in Cincinnati than their own grapes. The fruit dealers there told me so.

In preparing the ground on Kelly's Island they dig ditches, paralled to each other, three feet deep and thirty feet apart ; flat stones are set up in the bottom, so as to form a roof, and small stones are put on these to within fourteen inches of the surface, when they fill the ditch with a plow. They think the common plan of trenching *does more harm than good!* Then they plough the whole ground as deep as they want to plant the young roots. Their distance is 6 by 8. They train on trellisis.

Nine miles east of Cleveland, at Collamer, among other vineyards, I visited those of Dr. Dunham. He has four acres in bearing, and is putting out eight or ten acres more. He has the Catawba mostly, which is the best grape for that region. I did not hear much of the Delaware. Of course, it would do well. Almost all these vineyards have a northern or north-western exposure. The vines were loaded to their utmost capacity. I cannot do better than to give Dr. Dunham's own account, which he has kindly furnished me.

Dear Sir—In reply to your inquiries, I would say : 1st. That in preparing the ground for a vineyard, we simply give our land a good, deep ploughing, and then with a spade prepare a place for the roots. If the ground be sod-land, I should prefer having it broken up late in the fall, and then, before setting the roots in the spring, I thoroughly harrow to prevent the growth of grass, which is apt to show itself at the edge of the furrow. When practicable, I should much prefer the Michigan, or double plow, which throws the sod at the bottom of the furrow, placing it so deep that the grass cannot possibly grow, and furnishing food for the young vines.

2d. Our method of cultivation does not differ, materially, from that given to other crops. We use the plow, cultivator and hoe freely, so as to keep the ground clear. We are careful not to plow deep, near the vine, so as to endanger the main roots, but prefer cutting off the surface roots. After the crop has been gathered, we plow, throwing the earth to the vines, leaving an open furrow midway between the rows so as to carry off the water, and in the spring plow from the vines.

3d. We train our vines to two stakes each (stakes seven feet long), placing them from twenty inches to two feet on either side of the vine.

4th. We adopt the spur, or short pruning, leaving spurs, with two buds each, at regular intervals, and the leading cane with five or six buds. When vines first begin to bear there should not be more than one or two spurs left on each branch, but as the vine acquires strength more should be left.

5th. Our vines are now seven and eight years old, and this season yielded four and one-third tons per acre. I think they may be made to yield five or more tons to the acre.

The reader will observe that here is no trenching at $75 an acre, nor draining at half the sum ; and not even sub-soiling. The Cincinnati grape-growers, in speaking of this method, predict that after a few years vines planted in this way will gradually die out. I could not see it. But suppose they do. It is easier to replant a vineyard every ten years than to trench. It is a small job to raise roots from layers.

Four tons and one-third are 8,666 pounds. Twenty bushels of wheat, a good yield for an acre, are only 1,200 pounds ; 50 bushels of corn, 2,800 pounds ; 100 bushels of potatoes, 5,000 pounds. The average price of these crops will not be two cents a pound. If grapes will not bring eight cents a pound it is more profitable to make them into wine. An acre of Dr. Dunham's grapes would make more than 700 gallons of wine. After the fourth year, the expense attending an acre of grapes will not exceed that of wheat, because what costs more is balanced by the pleasure one has in working them. A horticulturist often prefers some kinds of work to eating oysters or reading novels.

Here is the place to show how one is to be free from the care which burdens so many, in wanting help. It is to be understood that no more is to be undertaken, except in times of harvest, than you and your family can do alone. As a general thing, I never saw any good come of depending on hired help to raise large quantities of fruit ; and in commencing the business it will not do at all. Often will the waste of wages consume the profits, and more too, and the deficiency must be met from other sources. Where there is much hired help, there are repeated complaints of carelessness, and of rare plants being hoed up, because they are supposed to be weeds. The great evil lies in having too much land. Twenty acres, well worked, make a large farm.

I will speak of one more vineyard, and where much other fruit also is raised. If I desire one thing more than another, as regards our country at large, it is, to see professional and literary men become growers of fruit, owners of enough land to make them interested in farming affairs ; for there is no other way in which they can so much honor industry ; so well preserve and build up their health or lay deeper the foundations of Christianity and Civilization.

I visited the grounds of the Rev. A. S. Hayden, a well-known and popular preacher in Northern Ohio. A few years ago he accepted the place of principal of the Western Reserve Eclectic Institute, indeed he was a principal founder, and under his instruction, Major-General Garfield, then young, began to unfold his powers—afterward, he became a teacher, and finally, on the resignation of Mr. Hayden, the principal. At the same time, Prof. Wilbur, now secretary of the Illinois History Society, was a teacher, and the three worked harmoniously together.

Mr. Hayden's farm is seven miles east of Cleveland. I had not seen him for several years. As I approached, I saw him carrying a pail to the barn. I searched for him and found him feeding swill to his hogs, which were kept in a neat, dry pen in the barn. I stood on the steps above; he did not see me; at last I spoke, and asked the farmer how he got along. It was a mutual surprise. He did not look a bit older than ten years before. We remembered much; we had forgotten more. Almost the first thing he did was to show me his grapes, growing in bountiful clusters on the trellis and extended arbors. Through the grounds, and interspersed with these, were boughs bending with beautiful yellow peaches. How many men, brought up exclusively to farming, have no such sight to show—no such fruit for their families to enjoy. It is to be added, that horticulture does not interfere with the reverend gentleman's sermons. On the contrary, I am sure he is better able to speak by being acquainted with so much that is of interest to " men's business and bosoms." Honor to all such literary men.

Only a few years ago no grapes were seen in this region. Now you see vineyards on rough and unlevel grounds, and on the side hills, where boys used to hunt for poor strawberries, and where two acres of land would scarcely keep a sheep, they pick enough grapes to feed and clothe a family and to educate the children. Springing through the flagstones at back doors are Isabella grape-vines; they cover the kitchen and run along the wood-house, often a hundred feet, and here they pick grapes in large baskets.

We returned to visit the old home. All but one were living; he sleeps quietly and well. A favorite spot was sought; the ground was no longer familiar; and standing confused where, when a boy, he played, he looked at the grapes on each side and hanging down over his head. Years ago an apple-tree was planted here; the boy watched it when it first bore, and the apples were the reddest and most beautiful of all earthly things.

On the subject of pruning, many who have started to raise grapes have been in doubt, and often have gone wrong. But one need not go much astray if, steadfastly, he will bear in mind that grapes will not grow on the same wood twice; consequently, that the vine, or the wood, which is to bear fruit next year, must be put in proper condition to do so, by pruning, this year. In carrying out the details, there are varieties of opinions, and so various that I do not find an exactly similar treatment in any two distinct localities; still, they all agree upon this main principle. As a reason for this, one writer states that two-year-old wood becomes too hard to permit the fruit buds to burst. Surely he did not consider that fruit trees of every kind only bear on wood of the previous year's growth. The fruit spur is ended and destroyed in fruit. I have noticed quite a rage among some pomologists to shorten in their fruit trees during the summer, that is, to cut off the ends of the branches. Their object may be well enough, such as making the tree more stocky; but one thing is certain, the tree does not bear, because the buds which the tree was developing have been cut off.

The old Roman method, undoubtedly established by slaves—for even the schoolmasters and book-keepers of this people were slaves—the German method and the Cincinnati method is to raise single vines about five feet high, and during the summer to clip or jerk off all shoots except one, which is to be the cane for the next year. There is reason to believe, however, that the Cincinnatians have departed from the German method to some extent, at least, as established some years ago, for the poet Gray, writing from Rheims, June, 1739, says: "The country round about is one great plain, covered with vines, which at this time of the year afford no very pleasing prospect, as being not above a foot high." I have before stated that they get 100 gallons more wine to the acre at Cincinnati than they do either in Germany or France. Here is a good place to quote from Lord Byron, who says that he sowed many wild vines, probably roots, in some old vineyard, which had climbed high trees and borne large quantities of fruit. Whether such examples could teach the Italians anything, a portion of whose country is still as savage as the territory of Idaho, is doubtful.

The Hermann method, and the Kelly Island method are similar to each other. This is, to let the vines spread out, like the branches of a fan, the number of which, in the fall of the year, and including all extended branches, will be twenty or thirty. When they prune, they cut out the old wood, and some of the new, and shorten in those which remain, with the object in view to let no more bearing branches remain than the strength of the root will support well. They confess it impossible to give particular directions and say they rely wholly upon their judgment, in connection with the condition, aspect and location of the vine.

Many do not prune till midwinter, or till even so late as March; others advocate the forepart of December as the best time, and I think with good judgment. That every branch has a particular root on which it depends for support may or may not be true, but it is certain that all roots lying below the reach of frost, and all of them, when the ground is open, start out little spurs for fibrous roots, and I do not hesitate to declare my belief that extended from these are the future fibrous roots, but which at present are wholly invisible. To illustrate, I would say that all roots and all grain first sends out an invisible root, which leads on and prepares the way for the visible root. This is what I have called the spiritual roots of plants, and it shows the importance of having ground prepared fine for all crops. I can show this more clearly. I have a cistern which constantly leaks, but which supplies sufficient water, except in a dry time. By the side of it stands an oak tree which, since the cistern was dug, has grown most rapidly.

Last summer we cleaned out all the water, and on going down we found the wall cracked in several places by the roots of the tree pushing through, and even as low down as sixteen feet. On examination, by the light of a candle, we beheld a marvel. On the tip end of the roots, which had forced their way through the cement, were little films, white and cloudy, and though in immense numbers scarcely perceivable. They had some appearance of fog, but were more transparent. Passing the hand over them, they disappeared like a dream. They appeared both above and under the places where the water stood. I could not help believing that we had a glimpse of the spiritual world of the vegetable kingdom.

If grapes are not pruned till late much sap will be lost, as it rises in mild winter weather, and nourishes both cane and buds which are yet to be cut away—while at the same time those which are to remain are to this extent weakened. May it not be said, that in no climate can fruit flourish in which there is not more or less of winter growth ? The general practice then is, to raise every season one cane or more which is to bear the following year, and to cut out the old wood. Nothing seems more simple.

Now there is another system of pruning which is strongly objected to by those who do not practice it, and which is persevered in by those who do practice it. This is the spur system. So far as I can hear it has been successful. It is practiced to a great extent on the Ohio lake shore. It is generally agreed that it is important the vine should be trained to a single shoot the first year, and be cut back less and less every year till the third, when the vine may bear some ; it ought not to bear much. "In the spur system, 'I quote from a certain work,' when the vine is two years old, the shoot that grew the year before is pruned back to two eyes, from these two canes are grown. The next year one of them is pruned back to two eyes, the other cane is pruned so as to have from six to nine eyes to form the trunk. One of the shoots from the spur is removed, the other pruned back to two or three eyes, while on the shank one spur and a bow is left. The bearing wood may be increased by and by to two long bows of from 12 to 13 eyes. This method requires stakes, otherwise is the same as in dwarfing." The author concludes this part by saying there are considerable variations to this.

Now on the Ohio lake shore I saw simply two stakes, as Dr. Dunham describes, and I saw the vines in various stages of growth ; nor did I see a single vine in a bow till I got to Cincinnati, where the vines are dwarfed. From the same author I quote what he says about dwarfing :

"The stem of the vine is allowed the size of from six to twelve inches, with three or four shanks of the same length, branching out all around, on which spurs from four to five eyes are pruned for bearing, and afterward removed, while young shoots at the same time are raised to take their places. The training gives the appearance of dwarf trees, and the more skill there is exercised the better they will look. They may look well sometimes, at other times not so well ; for wherever that staple grape, the Catawaba, has been dwarfed, except in some few places, it has done its prettiest to rot. By the way, the vines I saw at Cincinnati were raised as if to make them in the shape of good sixed whip-stalks five feet long, and this is done in four years."

Now, in the name of common sense, why is it that no grape grower can give a system of pruning without adding, it is difficult to tell how it is done, and more than all, why will experts mutually charge each other with knowing too little of what they are talking about? Can it be possible that both are right? For my part I have followed their directions so close that last year every single Catawaba I had rotted, and to cut through the whole business, I am going to give the following directions, which I am going to adopt myself, and whether I succeed or fail, I am certain some one will disagree with me.

Have the land facing the south. Plow twenty inches deep, if possible. If you can't put in much next year, wait till the year after it; have the soil of first quality, and plant ten feet apart. Cut back to two eyes the first year, and if both grow, rub one out; second year, cut back to four eyes; third year, cut back to six or eight eyes, all the while keeping a single cane. I would have stakes on which a trellis can be built ten feet high. Raise fruit on the previous year's wood, and cut out the old wood. I would have no other crop on the ground, except in the first year I would sow clover. I would plow deep between the rows to within four feet of the stakes; the rest of the space always with a cultivator. After the third year I would keep out the plow, and give an exclusive surface cultivation. The roots are getting a foothold; by no means should they be disturbed, and they will loosen the soil themselves. In the West it is hardly suspected how much damage deep plowing does corn in midsummer. If you follow the plow through the field at a distance of a rod or so, you will hear the roots crack all the way. Always the corn takes a back set, and will require a week at least to recover, so that cross plowing may be done. If both plowings are done at once, the crop is nearly ruined; it will never be more than half a crop. And yet all these old corn growers have stories to tell how much corn poor men raise, with no team to work it, and use the hoe alone. A cultivator is similar to a hoe. Often a crop of corn is superior when grown on sub-soiled land, because the roots can get down out of the way of the plow. So with grapes. It is a question whether frequent stirring of the land during fruitage is not an injury. With small fruit it is known to be so. There are authenticated accounts from Cincinnati of well established vineyards grown up to weeds, and yet rotted less and bore more than adjoining ones which were kept clean. Weeds may be mowed down.

I will add to my directions, or to my own plan, that I am going to let some of my Catawbas run up on poles, forty feet high, if I can obtain them so long. It is said the dew rots grapes. Everybody knows and should realize, that grapes thrive on the sides of houses. Is it because the roots go in part under the house and keep dry; is it the drainage of the cellar, or cistern; or is it because the dew does not fall on them? One thing is certain—they are thickest and best on the highest part of the vines. On a high pole there may be less dew—of course there is more air.

Should the plan succeed, you will see slight, tall timbers mortised into other timbers, making a permanent frame-work; the vines will run on wires, and you will also see huge canopies of depending grapes. If they will only grow, there need be no fear that they cannot be gathered. This is a private affair of my own—others may try it. I have said little of the two or three different kinds of rot, mildew or blight, and I have no remedy to offer. When a drunkard has the delirium tremens you cannot prevent his seeing sights—such sights!

I gladly leave the debatable ground and turn to the subject of propagation. There are various methods.

FIRST, OF CUTTINGS.

These should be from ripe one-year old wood. Dig a trench in spaded ground, slanting to the surface, the length of the cuttings. Place them five or six inches apart, the top eye just above the ground. Cover the lower joints with rich mold, and fill up with soil from the trench. They should be cut back the second year to two eyes and treated as before, and at the close of the year they will make number one roots. The above direction is from Mr. Buchanan's book.

SECOND, BY LAYERING.

"This is Mr. Husmann's method. In the spring, before the bud starts, make a bed of fine mold under your vines (in the row), then take canes of last year's growth, prune off all dry and imperfect wood, and fasten them down by wooden hoops. Let them remain till the buds have sprouted, say six or eight inches long; then fill fine mold around the shoots an inch deep; and, after two or three weeks, fill up another inch. They will strike roots readily, and make splendid vines for next spring's planting. A good vine treated in this manner will make from thirty to fifty plants in a season. The same process is often followed with the young shoots during June and July. For the latter purpose, all the suckers should be left on the vine you wish to layer, and the ends of the leading shoots pinched off. To force the laterals into stronger growth, the former method, however, makes the best plants." Several grape-growers told me that layers from two-year old make much the best roots.

BY EYES IN PROPAGATING HOUSE.

Mr. Phœnix says: "Our propagating house is a triple row, each thirteen feet wide and one hundred feet long, walls of brick, and heated with hot water-pipes from Hitching's steam boiler. We prefer plants from single eyes, turned out in good borders in May and June, staked, and laterals pinched in to secure a single well-matured cane. This makes the most perfect plants in the world, with immense roots, and a perfect maturity of and entireness throughout that cannot so well be secured by layers."

Another method I give by Mr. Husmann. It seems more complete; it will be seen they differ—others must judge. However, one must always remember that the prairie soil works marvels.

"A hot-bed is to be prepared as follows: Dig a pit from two to two and a half feet deep, then put on from twelve to eighteen inches of strong manure; on this put from eight to twelve inches of well-pulverized soil; then make a layer of short moss, in which insert the buds in a slanting position. They are prepared in the following manner: Take well-ripened wood and cut it into single eyes, leaving about half an inch of wood above and below the bud. Kinds that have very hard wood will root more readily if cut a week or two before, put into a box, covered with sand, and left in a moist cellar to sweat. After having pressed your buds into the moss in a slanting position, in rows three inches apart, and half an inch in the rows, cover up evenly with fine sand, and place a common hot-bed sash over them. They must be kept moist and given air freely, or they will damp off. An immense number of plants can thus be grown from a few vines, and in a small space. But they need close attention, and will, at the best, only make weak plants the first year."

It is to be remarked on this that horticulturists all agree that as good plants can be raised from eyes as from layers if the wood is ripe, and if they have time.

FOURTH, BY GRAFTING.

Many have been very successful in grafting upon grape-roots; others have not succeeded. The difficulty seems to be as to what time between fall and winter is best. But I think it may be said that whenever the sap is the most dormant is the proper time. Mr. Coleman has succeeded in almost any manner of grafting, frequently not tying; he grafts at the collar of the root, and then draws the earth around the graft. He makes a wedge of the root, and then slits the graft, thus inverting the method of common grafting. People should try grafting good Delaware wood on the Catawbas where they rot. They are reported to grow finely, and to bear soon.

Mr. Williamson gave me what they are trying to keep a secret in Cincinnati—that is: a new method of grafting. If it is a secret, I am glad I hereby cause it to cease to be one. It seems to me of the highest importance. This is it: Just as the bud begins to push out in the spring he takes a good vine of last year's wood, and splits it next to every joint, but perhaps so as not to open it, and inserts a wedge graft of any vine he chooses. He has the wedge thicker on one side than on the other; the graft has two eyes; then he covers from six to eight inches deep, and covers up the graft so deep that the upper bud is an inch below the surface. If the top bud were uncovered, as is the case with cuttings, the warm weather would swell the bud before the graft could knit, leaves would put out, and finally, for want of support from below, the graft would die. Cuttings for this last reason also should have the top bud covered, that there might be a sure growth.

Now there comes a very important consideration with regard to Norton's Virginia and Mead's seedling, which will not grow from cuttings; graft the cuttings, will they not grow if treated in this manner? At any rate, between this method and of the grafting they and all other varieties rapidly can be propagated. I submit whether Mr. Williamson's secret is not the most important one we have had, in regard to grapes, for a long time. But it must be proved.

THE KINDS OF GRAPES BEST TO RAISE.

I am not going to trouble the reader with a long list of sorts. The question is, which ones, over the largest extent of country, are giving most satisfaction? From every quarter I hear nothing but praise of the Concord, both as a table and wine grape. Next comes the Hartford Prolific. Neither is of the first quality, but people want grapes. Norton's Virginia, over in Missouri, as a wine grape is superior to either. There are several others which fewer persons also speak well of; particularly the Herbemont, but this requires protection during the winter. Of the Catawba, it is famous, and the lake and the people there will take care of it. Elsewhere it is a source of grief. After looking over the whole subject, I come to the conclusion that, with these three, I would stop. There may be uplifting of hands at this, but I say these hundred sorts or so of yours need further trial. If a customer wants more, as he should have, that is, a few for trial, every nurseryman will give what he calls for, or what he thinks may do well. Remember I am speaking only of that part of our country lying between Kansas and Pennsylvania, and this, too, of field culture. Sheltered by buildings, many of the fine variety will do well.

WHAT SHALL OWNERS OF FARMS AND TOWN LOTS DO?

Plant grapes ten feet apart, against every wall. Wherever there is a wall, plant. If your house is a poor one, vines running over it will make it look well. There may be some pride in having a stone front to show. Consider whether a slender vine of the Delaware, Iona, or the like, might not give it an additional touch. If farmers will plant grapes around their barns, and fence off the cattle, they will find there are other ways to make money than to raise grain. A mechanic, with a poor house, and only a few feet of ground, at a little expense, may teach his children, when they see what their neighbors' boys want, not to steal. To raise a plenty of fruit is a first step in teaching children to be honest. Nothing is more certain than that, as a general thing, grapes do better against walls, and in towns, than in open country places. I have often seen beautiful grapes growing in back yards, wholly surrounded by walls, in New York city.

WINE-MAKING.

In a former article I spoke of a wine-cellar. With an acre of grapes it is necessary. Much stress is laid by the Cincinnati folks on having everything clean. One cannot be too important in this. However, it will take some time for the gentleman amateurs of our country to become accustomed to our native wines, particularly those who have become attached to Spanish wines; for, though they never were certain of their purity, they were sure of one thing, that is, a flavor derived from pressing the grapes by naked-legged peasants, and transporting the wine greater or less distances in rank goat-skins. But this prejudice will die out. Mr. Buchanan says:

"The wine press is something like the screw cider press. An iron screw three or four inches in diameter, is used either in a strong, upright frame, or coming up through the centre of the platform; the latter is the cheapest and most simple in construction. A strong, tight box platform, six or seven feet square, of two or three inch plank, six or eight inches high at the sides, is wedged into heavy timbers, and in this a box of $1\frac{1}{4}$ inch boards, five or six feet square, perforated with holes near the lower edge, ten or twelve inches high at the sides, made to be readily taken apart, is placed to contain the mashed grapes. Boards to fit loosely inside of this box, and lay on the top of the pile of mashed grapes, or *cheese*, as cider-makers call it, and pieces of scantling to lay across to receive the pressure, complete the press. The power is applied by a long lever attached to the nut, and the juice runs out through a hole, with a spout in front, into a large receiving-tub."

The grapes should hang till dead ripe; pick off all decayed or unripe berries, then bruise in a mashing-tub, or pass through a small wooden mill, which bruises all but the seeds; then empty into the press, apply the screw until all the juice is pressed out. The outside of the cheese is cut down and thrown on top two or three times, as in cider-making. The juice is then put into clean casks in the cellar to ferment, which will require from 15 to 20 months. It is not really made before this time. Large quantities are sold to dealers as it comes from the press, or soon after, by those who wish to realize at once. All the vessels should be perfectly clean, that there may be no flavor but that of the grape. A large cask, say 600 gallons, will make better wine than a small one.

There is a sieve with meshes of three-quarters of an inch, used to free the stems from the grapes, simply by pouring the mashed grapes into it, a few shakes will cause everything but the stem to fall through. At Hermann they draw the stems through a rasp made for the purpose; this would be before they are mashed However, they do this only with valuable grapes.

Mr. Williamson says that wine made as late as possible is always best. It is no time to commence making wine when the grapes begin to fall. All that will fall out to have time to fall. Mr. Williamson's plan, before pressing, is to have the grapes picked during the day, brought to the press and put in clean barrels, to undergo a partial fermentation in their skins during the night. He is opposed to selecting anything handy to pick grapes in. There should be baskets for this purpose alone.

At Hermann they wait till the grapes are quite ripe, pick off all decayed berries; of unripe ones they make inferior wine, such as claret; they bruise in a tub with a wooden pestal, or run through a wooden mill—Hickok's cider-mill answers the purpose—by taking off the upper zinc cylinder, then they empty into a large fermenting tub, with a faucet in one side, cover with a cloth, let them ferment twenty-four hours, draw off and press; some immediately, some let them ferment three or four days; the more they ferment the better will be the wine, the longer it will keep; the less they ferment the sooner the wine will be ready for market. If the casks are new they should be filled with clean water and leave to soak eight days, then scald with hot water, when dry fume with sulphur. Fill the casks within three inches of the bung. In February or March the wine will be clear, then it is racked into clean casks and bunged tight. A slight fermentation will take place in May, when it is racked again, and the wine is made. All these things are done under one roof. They have tools and contrivances which enable them to work fast.

As I said before, a work on grape culture is greatly needed. One who understands the subject, and, above all, who knows how to express himself clearly, will be welcome. There is a pressing need for light on many points, and yet we have attained much. The American Encyclopedia, 1830, says: "There has been reported to be a very fine native grape growing on the Arkansas, but travellers have sought for it in vain." This undoubtedly was the Catawba.

THE NORTON SEEDLING GRAPE.

An animated discussion took place upon the question, whether the Norton Seedling (Norton's Virginia) is a hardy variety in this vicinity.

Mr. John G. Bergen said that Mr. Meeker speaks of it as perfectly hardy in Missouri, and a most excellent wine grape.

Mr. Wm. S. Carpenter said that it was not hardy here, and thought that this Club should discourage people from planting it, as it will almost certainly produce disappointment.

Mr. W. R. Prince objected strongly to this view of the case, and contended that it was one of the most hardy varieties, and a good wine grape as far north as Massachusetts. He said that it was not a seedling, but a wild wood grape, found in Virginia by Dr. Norton. If any one fails, you may be sure he has got a spurious sort.

Prof. Mapes said that it had ripened with him, but thought it owing to peculiarity of soil or situation, as there is a complaint of its not ripening generally.

Mr. R. W. Holton said Dr. Underhill could not succeed with it; his vines were very much diseased the past season.

Dr. Trimble would be very glad to hear that it was hardy, as he esteemed the quality.

Mr. E. Williams said that he was so well satisfied that it was not hardy, that he had refused to grow it or sell it.

Mr. Solon Robinson characterized any attempt to bolster up such a variety as Norton's Virginia, as anything but honest, just or proper, and thought it the duty of this Club to raise its voice in opposition. It succeeds in Missouri, and there let it remain. It does not succeed at Cincinnati, and it is perfectly notorious that it has almost universally failed in all the north-eastern States.

Mr. Wm. S. Carpenter read the proceedings of the National Pomological Convention, to show how strongly its cultivation had been denounced.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

December 29, 1863.

Mr. Nathan C. Ely in the chair.

ARTIFICIAL FERTILIZATION OF CROPS.

The Secretary read the following article from one of the foreign journals:

"A singular discovery has lately been announced in France. The discovery, however, is that of a Dutchman, M. Hooibrenk, and the results of his researches have been so well marked and valuable that he has been awarded the Cross of the Legion of Honor by the Emperor, who has directed that a scientific commission be appointed to investigate and report upon the matter. M. Hooibrenk supposes that the number of grains in an ear of corn can be increased by bringing a larger quantity of pollen into contact with the stigmate than they usually receive. He conducts his experiments as follows : he takes a cord of from twenty-five to thirty yards long, and fastens it to a stiff woolen fringe of about ten inches long ; he steeps it for a short time in honey, and drags it over the fields of corn two or three times after flowering. It catches the pollen from the anthers and applies it to the stigmata; it is, in fact, Mr. Darwin's bee process on a gigantic scale, and the result is a greatly increased crop. This method has been tried in conjunction with the old one, on the farm near Epernay, in Champagne, the property of the celebrated wine dealers, Messrs. Jaquesson, the results beneath show the relative advantages of both systems:

	Hooibrenk's System. KILLOGRAMMES.	Old System. KILLOGRAMMES.
Wheat	31	21
Rye	25.5	16
Barley	24	16
Oats	17	12

It has been conjectured that the results would have been still more striking, had not this season been such a favorable one. Fruit and garden vegetables have been similarly treated and with a like success. It has been found also that an inclination of 112° of the branches of the vine produces some effect upon the flow of the sap, and increases the fruit crop. M. Hooibrenk maintains that by his process, and without any material additional outlay, crops of fruit, vegetables and corn can be increased in value fifty per cent."

Mr. Wm. S. Carpenter.—This is certainly a novel discovery, and I hope some of our cultivators will try the experiment. I found last year a great many ears of my corn were not well filled. As the facts seem to be well authenticated, I trust the experiment will be fairly tried.

Hemlock Hedges.

Mr. R. H. Williams.—Last year I was at Flushing, and observed a hemlock hedge growing on the lands of the Messrs. Parsons; this hedge had been growing some three or four years, but he understood it was generally winter killed, and attributed it to the fact, that the hemlock was not indigenous to this part of the country, and I would ask if the sea air does not affect it.

Mr. A. S. Fuller.—As to its being indigenous to this region, there are large natural trees growing in Messrs. Parson's vicinity, and that such growth is natural upon all rocky portions of Long Island and New Jersey. I think if the hemlock was planted in dry, high soil, it would live, as the hemlock grows in the northern sections of this State.

Mr. Cavenach.—In Greenwood cemetery, a number of the lots are inclosed with hemlock, and certainly Greenwood is more exposed to sea air than Flushing.

Mr. Wm. S. Carpenter.—I think the native hemlock will flourish anywhere —go up the Harlem railroad and you will find the hemlock growing upon the side of the Bronx river, and in some places I have seen the trees growing in water in great luxuriance. In Europe it is thought one of the most beautiful of trees. No evergreen hedge will stop cattle, though useful for shelter and ornament, and for this purpose the hemlock is good and is easily grown. In my opinion honey locust is the most suitable plant for a hedge fence in this section of the country.

Mr. Cavenach said that he had made an ornamental hedge of silver maple, which is very promising.

Dr. Wm. Hibbard thought that as hemlock will grow in all parts of the country, and because it sends out strong horizontal limbs, it would be just the plant that farmers want for hedges. It grows naturally in mountain land, but it will flourish on the sands of Long Island, and it must be as good as red cedar for hedges, and that we know has been much used and is excellent. Such a hedge would, on account of its protection from winds, add greatly to crops.

Prof. Mapes thought the propensity of cattle to browse would be fatal to any evergreen hedge.

Mr. A. S. Fuller thought their propensity to pitch into and tear it would be equally fatal.

Mr. John G. Bergen said that cattle browse all kinds of hedges, but that does not injure all kinds of plants. They rather improve a hedge of apple, pear or quince, though they do not add to their beauty. For shelter, locust hedges has succeeded pretty well.

Mr. R. H. Williams.—In Rochester I was much pleased with the evergreen hedges. The Norway spruce makes a beautiful hedge. Also in Geneva they are planted as screens to protect from the winds.

I believe almost all the trees that flourish in this country will make permanent fences, and I think it a subject of great importance to know what effect soil and climate have on the hemlock and other hedge plants.

The Secretary.—Mr. Thomas Bell, Eatontown, New Jersey, has a splendid hedge made of the Osage orange that will turn any kind of stock.

Mr. Wm. S. Carpenter.—The Osage Orange is not reliable with us for hedges, it is very liable to be winter killed.

Mr. John G. Bergen.—In moist seasons I have found my crops to grow quite up to the trees, but in dry season they will not grow within twenty feet. Now one word in relation to hedges, I would prefer a field without a tree or hedge for wheat, corn or rye.

Mr. Solon Robinson said that gentlemen appeared to forget one very important matter in all these recommendations of plants for hedges, which naturally grow to the size of large forest trees. Clip their tops as much as you will, to keep them within reasonable bonds of a fence, still their roots will extend, almost as much as though the tops were of a natural size, and draw their sustenance from the soil, so that you must surrender a strip about forty feet wide to your hedge. Can any farmer afford this? Then you have been told here to-day that red cedar makes excellent hedge. Is that so? Let us look at some facts. John Taylor of Caroline County, Virginia, who wrote the first American book upon Agriculture, and who was a very intelligent, progressive farmer, thought he had discovered the very plant for fencing in the red cedar, and planting it extensively in hedge-rows, and induced many others to plant also. That might have been fifty or sixty years ago. What is the condition of these fences now? It is such that any neat farmer would readily be at the expense of digging up and burning every tree. The experiment of hedging with cedar has proved its utter unfitness. It has been necessary to dig ditches upon both sides where the land was cultivated, on account of the spread of the roots, and the tops have required eternal vigilance to prevent them from overtopping all cultivated plants. The same result will be reached by whoever tries to fence with hemlock (*Abies Canadensis*). Like disappointment has befallen almost every one who has tried to make live fence in this country, particularly in using forest trees for hedges. Yet men stand up here in this Club and gravely recommend farmers to fence their land with hemlock trees, which with a pair of shears they are to dwarf into hedge plants. The thing is simply ridiculous. Besides, no crop can be grown near a cedar or hemlock hedge, and not many things will grow near a hedge of any kind that is made of large trees ; and it is notorious that an osage orange hedge absorbs all the strength near it in a light soil. In England, the owners of land are digging up hedges on this very account. Yet here this Club spends two hours of argument, trying to prove that the worst plant in the world for hedges is the best.

Mr. Cavanach corroborated this statement, by a report of a hedge of white pine in Brooklyn that nothing would grow near, and that land around evergreens was generally unproductive of any cultivated crop.

Barley—How it is Sown in Russia.

Mr. Erhard Smidt, who is evidently from the country he speaks of, though he writes now from "High Place, Andover, Henry county, Illinois," gives the following items, from which all grain growers may get a useful idea. We give it in his own forcible language.

"The farmers in Courland, Russia, are sowing the barley late in the evening and bring it under before the next noon thinking that the crop will be better than when the seed is covered immediately. Reason : the dew of the night shall make the grain soft, and so it gets a better start. See Schwarz, Anleitung zum practischen Ackerbau.

"One other case :

"A farmer could not get the sown barley covered an evening before the Suntide holidays, and the seed was lying for two days and three nights uncovered. The barley was given afterward a heavier crop than all the other. Sprengela Monatschrift.

"Nothing said about the influence of the moon."

A Great Crop of Mustard.

Mr. Smidt, the writer of the above, says that his crops of English white mustard seed last season, was 12,000 pounds, and he would like to sell it direct to some mustard manufacturer, and then he thinks it would be a profitable crop. One of the greatest difficulties that western farmers labor under, he says, in the necessity of employing agents, or middle-men, to sell their crops to the consumer or manufacturer.

Location and Cultivation of Grape Vines.

Mr. Solon Robinson read the following report of remarks made by Dr. Bull, the originator of the Concord grape, which he made at a late agricultural meeting at Springfield, Mass., which contain some useful information to all grape growers.

"He said that he was born in Boston, but ill-health compelled him to choose a home in the country. He had located on a hill-side in Concord, and for twenty-seven years had been experimenting with grapes. He had tried almost every variety that had any reputation, and in numberless instances had been disappointed. He was satisfied that by experimenting with hardy grapes we should reach something better even than his own favorite bantling—the Concord. We must watch and wait a little longer for the perfect grape. By growing new seedlings in the various localities of the State we shall finally succeed. The best exposure for a grapery is a southern hill-side ; the best distance, six by ten feet apart ; the best position, rows running north and south ; the best fertilizers, ashes, bone dust, plaster and sulphur ; the best mode of pruning, the spur system ; the best vine, the native. The grape wanted heat and light. It was a mistake, therefore, to invite the roots down deeper than twelve inches, and four to six inches would be better. His best grapes grew on a poor hill-top that was plowed and manured as for a crop of corn. He had two acres of grapes in bearing, and the present year sent a ton of grapes to market on the 20th of September, which sold at ten cents a pound, and beside made 400 gallons of wine. The Concord has yielded 600 gallons per acre. He has raised in 20 years 104 seedlings from the Concord, 17 of which were better than the original. No crop is so easily affected by the odor of manures. Wool waste in a given case had imparted a wooly odor, and guano and night soil their distinctive properties."

How to Feed and Grow a Monstrous Hog.

Mr. Allen B Benham Dryden, New York, writes, Dec. 14, that he has a hog estimated to weigh 1,400 pounds. He was three years old last spring, and weighed in February 1,120 pounds ; in May, 1,135 pounds. From that time, he says, till the middle of September I fed him lightly, intending only to keep him from losing. His feed last winter was a half bushel of ears of corn a day, with dishwaster for drink. The rest of the season, up to Sept. 15, his feed was two quarts of corn meal in the morning and two at night, wet up with buttermilk. (He used about twelve quarts of buttermilk per day.) Since Sept. 15 he has eaten about the same quantity of milk, and four quarts of corn meal in the morning, seven ears of corn at noon, and four quarts of oat, barley and pea meal, wet up with buttermilk at night, with the exception of about a week he has taken his food without cooking. I tried cooking his food about a week, and he did not eat it as well as the raw meal. He weighed on the 23rd of September last 1,249 lb., and on the 8th of October, 1,276, that being a gain of nearly 2 lb. per day. Mr. Benham would like to know if any one has ever made a heavier hog?

Mr. Solon Robinson says that reports have been published of one or more that weighed 1,450 lb., but he has not the reports at hand, and so he asks the question, what is the weight of the biggest hog ever known?

Prepared Paper for Mailing Plants.

Mr. A. S. Fuller exhibited specimens of paper prepared with India rubber and oil. This paper is manufactured at Newark, N. J., and is a superior article to pack plants sent by mail.

Adjourned. John W. Chambers, *Secretary.*

January 5th, 1864.

Mr. Nathan C. Ely, in the chair.

CONVERTING WHISKY INTO BRANDY.

The Secretary read a lengthy paper from Dr. Parker, Ithaca, N. Y., detailing the way he obtains "pure brandy." The brandy, the Dr. says, is made of five qts. of 95 per cent. alcohol, and four quarts of water, colored by a little caramel, or else with baked pears and apples. And this makes, he thinks, a purer brandy than most of the article sold as such in this city at eight or ten dollars a gallon.

The Chairman said as to this stuff called brandy, it is, by the doctors own account, simply proof whisky, or something only equivalent to it in strength, but not as good. If the alcohol was made at a whisky distillery, and thus reduced, it would be whisky, but it is not all made of such a base. Alcohol distillers use any kind of spirit, and sometimes it is a very base article, to produce the alcohol of commerce, using a "column still," which is an upright cylinder, divided into eight compartments. Very often the very dregs of a distillery are used to make a low grade of alcohol, that is, one of about 80 per cent. Standard alcohol is 95 per cent. when first ran off, but it cannot be easily held over 93 per cent. If the alcohol is a pure article, a drinkable liquor may be made by reducing, but as very little of it in market is pure, and was never intended by the manufacturers to be drank, it is preposterous to recommend anybody to make brandy out of it by reducing and coloring. The brandy manufacturers use an article called "pure spirit," that is deodorized spirit, which is far preferable to alcohol; but nothing can make good brandy but a distillation of the pure juice of the grape, though a much better article than the one described by Dr. Parker, can be made of pure spirit. There are manufacturing establishments in this city where any kind of liquor you can call for will be manufactured to order in a few days. It only requires a week to make "old Bourbon whisky," and the buyer has no doubt of its genuineness, because he sees the marks upon the barrels.

Dr. Parker replies to the chairman that the main fact of his paper is overlooked. It is, since no "pure brandy" can be had anywhere, farmers better make their own at a cheap rate, than buy a poorer fictitious article at a high rate. If we make our own, we know what we have, if we buy a known adulterated article, we are ignorant of what we get. If a farmer can for money buy a better article, or a safer one for family use, I should like to see it, as I don't believe it can be had; of course I do not call any made brandy the real article, mine or anybody's else.

WHEAT OR SPELT.

Mr. Matthias Herman, Walden, Orange county, N. Y., sends a sample of an ear of wheat grown from seed sent him by his father from Germany. It was sown in a bad place and badly treated, yet ripened in July without rust or any disease It yields more bushels per acre than rye or wheat, but weighs lighter. The objection to it is that the grains and hulls do not part easily, and for milling, for flour, it requires to be hulled. Mr. Herman thinks it worthy of notice by those who cannot grow other kinds of wheat.

Mr. Wm. S. Carpenter.—I tried this grain last year. I received it under the name of spelt; but as you have to hull it, I prefer other varieties, although it might do for feed as oats, yet I do not think it would yield as well.

DWARF PEARS.

Mr. J. A. Donaldson, St. Joseph, Berrien county, Mich., says: "Not any person who has not already learned that water standing around any fruit-tree is injurious. It is a fact that might as well be acknowledged now as later, that not one in a thousand has succeeded with dwarf pears. This may seem rather strong; but I believe that if a person should start out to find *one* who was making dwarf-pear culture profitable, he would find a thousand who had not got the first cost of their trees. But very few take good care of their apple orchards. It cannot, then, be expected that a tree requiring so much skill and care as the dwarf pear can ever be very generally profitable."

Mr. Solon Robinson.—We indorse every word of this; yet we do know *the* one who has succeeded, and we argue that, if one can, at least one more could, and then, if all pursued the same course, why could not all succeed?

Prof. Mapes.—For the reason that all do not succeed in any business. It is well known that many merchants fail, but no one imagines that, in consequence, the whole business is rotten. I can truly say that with me dwarf pear tree cultivation is profitable. The crop the past year will pay the cost of the land and its cultivation, leaving all other crops for profit.

TOBACCO GROWING.

Mr. D. C. Payne, Dekalb, St. Lawrence Co., N. Y., wants the Club to devote itself to the business of giving him full instructions about tobacco growing. He says: "Perhaps you can refer me to some treatise on the subject of tobacco culture, and the process of preparing it for market."

Mr. Solon Robinson.—Yes, sir, we can. And we can tell Mr. Payne one other thing that we have discovered: he does not take—or if he does, he does not read—one of the eight or ten papers printed in this State devoted to the interests of farmers. If he did he would have known that one of them, *The Agriculturist*, published last summer half a score of premium essays from tobacco growers; besides which, C. M. Saxton published a work to the same end; and besides these, there is Geo. Geddes's most excellent essay, that has been published years ago in the Transactions of the State Agricultural Society, and *The Country Gentleman*, and perhaps other papers.

A NEW KIND OF MUSK MELON.

Mr. T. M. Hopkins writes from Geneva, N. Y., to the Farmers' Club as follows:

"*Gentlemen:* I would be glad to do some little good in your line, if I can, though I am not a farmer. The following you may rely on:

"I cultivated last year a small piece of land, (say seven-eighths of an acre) outside of my garden. Early in the season I discovered several stalks of water melons, musk melons, tomatoes, &c., which, so far as I could say, were brought in the manure; and, as I am in the habit of letting all such things grow, thinking it possible that a new variety, or some improvement on the old, may be the result, I left these to grow. The manure had been brought from the stables in the town.

"One musk-melon plant particularly attracted my attention. It had been kept back by drouth till late in the season; it then commenced to grow rapidly, spread over a large piece of ground, (nearly a square rod), showed a somewhat singular leaf, so much so that I determined to remove whatever should embarrass it, and suffer it to grow as luxuriantly as it would. A single melon started, which bid fair to be a large one. After the vine had spread, as I have already stated, six or eight more were formed, all of them bearing a marked family resemblance, which was that of *a cross between a melon and a squash.*

"I will describe that which set first, which was the only one that fully ripened. It was very large; more nearly approaching a round form, than is often the case; had scarcely any of the common flutings on its surface; was of the color of lead, or nearly that—a color which was but slightly changed when ripe. Upon cutting it I found it very sweet; the meat hard, almost as much so as that of a squash; very yellow; fine delicate grain, and about as substantial for food as a first-rate sweet potato.

"The other six or eight did not grow as large, nor did they get ripe; and, as the season drew nigh for frosts, I picked them, carried them in, and laid them upon the mantlepiece, *in a warm place,* thinking they might mature, in some degree. They did so; became ripe; or, at any rate, ripened so as to emit that peculiar odor which indicates maturity in the melon; I cut them, found them nearly, or quite as good as the first; have saved the seeds of all of them. It is my present purpose to start them under glass in the spring, so as to have them ripen if possible before the cold nights of autumn. The last we placed on the table about the first of December."

GRAPES FOR A HIGH LATITUDE.

Mr. J. B. Proctor, writes from Center Rutland, Vt.: "I saw by the report of the Farmers' Club, of the 8th, an inquiry from a Milwaukee correspondent what grapes will ripen in that locality, and being in nearly the same latitude, I send a brief statement of the kinds I have now in bearing and the results.

"I have now in bearing the Concord, Delaware, Diana, Hartford Prolific, Rebecca, beside several local varieties of no particular value but to look at. Of the above variety I prize most highly the Concord. All the varieties were perfectly ripened here by the 25th of September, the Hartford, Prolific and Delaware about the 10th. I have had poorer success with the Diana than either of the others and shall discard it.

INQUIRIES ABOUT HEDGES.

Mr. Benj. F. Bartolet, who forgets to give his locality, says he has been very successful in raising the hedge of Washington thorn and Osage orange. I have a hedge of each kind that are perfect barriers for all kinds of cattle, are both useful and beautiful, and wish to extend them every year. As no seed can be bought, I have gathered about eight ounces of orange-seed, and will plant them in the spring, if I can learn how to make them grow."

Mr. Solon Robinson.—The best way to grow the seeds of the orange or the thorn, is to plant them just as soon as ripe, and mulch the bed with manure to keep it warm during winter. Dry seeds should be soaked, or kept moist in sand, in a box where it will be warm some weeks before the spring opens, and then the ends will be ready to plant as soon as the ground is, and will be ready to sprout as soon as the sun warms the earth. Sometimes it may be well to start the plants in a hot-bed, or in boxes in the house. But upon a large scale that would not answer.

The Secretary.—Mr. Thomas Bell, of Eatontown, N. J., has been very successful with the Osage orange for hedges; for the first three years you must be sure and keep it well pruned.

Mr. Wm. S. Carpenter.—Mr. Reid, at Elizabethtown, N. J., had great experience in hedge making; he recommends the honey locust as superior to the Osage orange.

Mr. Abram Parish.—I am acquainted with the line of travel between this city and the Mississippi river. I have seen hundreds of miles of Osage orange planted as hedges, all that it requires is proper cutting; when it is properly attended to I think it one of the first hedges grown, as a protection. It also makes a fence quicker than any other plant.

Prof. Mapes.—Mr. Reid was a very neat man, his hedges were kept in perfect order. In my neighborhood the Osage orange grows well and makes an excellent hedge, but I think by the common law we are not compelled to fence out our neighbor's cattle. There has been a great many views in relation to the use of fences. I think we only want an outside fence. Nicholas Biddle estimated that the cost of the fences in the United States was equal to the national debt of England.

Mr. John G. Bergen.—There is an idea prevailing throughout the community that the Osage orange is liable to be winter killed in our locality. The subject of living fences is a very important subject, and I hope we shall, at a future meeting, fully discuss it.

Adjourned.

John W. Chambers, *Secretary.*

January 12, 1864.

Mr. Nathan C. Ely in the chair.

Paint for Out-Buildings.

A farmer in Dutchess county, New York, wants the Club to discuss the subject of painting out-buildings of the farm. He says: "The question is not whether we shall paint them in order to preserve them, but what we shall paint with. We often see in the newspapers substitutes for the oils and lead generally used, and well recommended by the manufacturers of them. A very prominent one at this time is advertised by a manufacturing company in your city, called the Gutta Percha Paint. Now the important question is, Is it durable—is it cheaper than the oils and lead?

Mr. Solon Robinson.—I will give the receipt that I have given many times before, for the benefit of those who want line upon line, and precept upon precept, before they can get and retain knowledge. I hope that a few may be induced to use this cheap, durable paint, which is a better preserver of wood than oil paint, and has this advantage, that it can best be used upon unplained boards. This is the formula: take one bushel of good white-wash lime, and slake it, and mix it into a fine smooth white-wash. It will take at least forty gallons of water. Then add the following ingredients: 20 pounds of Spanish whiting, 17 pounds of rock salt, and 12 pounds of sugar. This mixture should be well stirred, and if mixed a day or two before using, it is better. Indeed it may be kept as long as desirable, and when needed for use, after thoroughly stirring, it is ready. It should be put on like any other white-wash, in a thin condition, and rough boards will require three coats to make a durable white color, which will stand the weather three or four years. It is one of the very best applications for shingles. Its color can be modified to a drab, by Rosendale cement, or to a yellowish shade by yellow ochre, and reddish by Venetian red, or any other tint, by some cheap color. I have used ashes, and so I have blue clay, to get a brownish tint.

Mr. John G. Bergen.—I am very glad to have this useful information go forth to the people, but I should like to hear why the ingredients added to the lime-wash improve its value so much that it becomes a permanent paint.

Mr. Solon Robinson.—The lime and salt are both antiseptic, and the adding of the salt makes the wash more penetrating. The whiting is of the nature of clay and forms a white body on the surface, and the sugar makes the whole so adhesive that a man may rub his black coat against a wall painted with this compound, and it will not show a shade of white.

Mr. Wm. S. Carpenter.—I painted one barn roof with oil and lampblack, and another with lime-wash and lampblack, and the last holds its color much the best and was materially cheaper. Lime is an excellent preserver of shingles. Witness the soundness of old roofs on the lower side of chimneys.

The Chairman recommended dissolving about a quarter of a pound of tallow in a pailful of the hot lime as it is slaked for white-wash, which will make it adhere much better and prevent it from setting off upon everything that touches it, as is too often the case with white-wash. He also said that he had tried the "India rubber paint," but does not intend to try it again. It is not valuable.

How Plants Grow in Primitive Earth of Rocks.

Mr. Solon Robinson read the following extract from an English paper, which was considered of sufficient importance to American farmers to be made a part of the records of the Club:

NOTICE OF A COMPARATIVE TRIAL OF QUALITIES OF VARIOUS PURE EARTHS FOR SUPPORTING VEGETATION, MADE IN THE NURSERY GROUNDS OF W. DRUMMOND AND SONS, STIRLING.

Garden pots eight inches in diameter were filled each with a pure earth, reduced by pounding to the consistency of gravelly sand, where it had previously exisited in the indurated or rocky state. Oats were then sown about the middle of April, three plants being allowed to remain in each pot. The pots were plunged to the rim in an open border, cinders of coal being put under them, and care otherwise taken that the roots of the oats should obtain no extraneous nourishment. The plants were watered with common spring water, a few times, in very dry weather.

The stalks attained, in general, to the height of two-and-a-half to three feet. The grain fully ripened about the beginning of September.

PRODUCE.

Earths.	Ears.	Grains.
Granite (Aberdeen)	13	220
Clay slate (primitive)	11	241
Greenstone (secondary trap)	10	245
Limestone	8	251
Chalk	13	355
Gypsum (very sickly plants)	6	40
Sandstone (silicious)	12	230
Pit-sand (brown)	12	210
Blue clay (10 feet below surface)	10	242
Mixture of all the above kinds	9	190
Common light loamy soil	18	453

Experiments of this nature seem worthy of further prosecution, particularly relative to the respective influence of the asmosphere and soil in the nourishment of plants. When the oats were sown, scientific as well as practical men predicted, that in most of these earths they would not grow; and when they saw them growing, predicted that they would not ripen seed. The results have proved otherwise.

A single experiment, in such case, can hardly be considered as decisive, excepting as to the possibility of plants living and maturing in an unmixed soil. The fact of their not succeeding, with one exception, so well in a soil composed of the several varieties as in a simple soil, is likewise noticeable. The superior success of the plants in loam is also to be observed, to show that their growth was not wholly dependent upon the atmosphere, as some would have us believe, and that the soil furnished something more than a mere support for the plants. The growth, in each case, must be considered as inferior; and without deducing any general conclusions, which might be premature, or endeavoring to fit the facts to any received theory, I submit it to the further inquiries of those who have the curiosity and talent to pursue these interesting investigations. If it prompts to other well-conducted experiments, my object will be answered.

The bringing of any considerable quantity of inert soil to the surface is obviously attended with uncertain results, so much depends upon the nature and condition of the soil so brought up. At the Duke of Portland's, at Welbeck, places were pointed out to me where the surface mold had been removed, a portion of the subsoil taken away, and the mold or top soil returned to its place; but in no instance was its previous fertility restored. Deep cultivation will undoubtedly in the end recover such places, but time and patience are indispensable.

Mr. John G. Bergen.—These experiments are valuable. Men engaged in agriculture generally cultivate the surface of the soil. I wish the experiment had been carried a little further, to show what effect would have been produced by mixing the various substances with the loamy soil, as that is what we want most to know—how to make the earth produce better. It was certainly interesting to see it proved that substances that we are in the habit of calling utterly barren are capable of growing useful plants.

Mr. Wm. S. Carpenter insisted that they had no effect whatever upon the plants—that they drew all their sustenance from the water and air.

Dr. Trimble.—It is known that in the forests in the southern part of our country moss is seen suspended from the branches of the trees without being connected with them, showing that the moss derive their nourishment from the air.

Mr. Solon Robinson.—Is Dr. Trimble aware that the moss only grows upon living trees. Roots or no roots, when the tree dies the moss dies.

Mr. John G. Bergen.—I hope the remarks of the gentleman are not intended to convey the impression that no nutrition is derived from the soil.

Storing Hay in Stacks vs. Barns.

Mr. D. F. Rogers writes from Waltham, La Salle county, Ill., as follows:

"I notice a discussion, at a meeting of the Club, upon stacking grain and hay. Allow me to add a word out of some years' experience in both methods, viz: stacking and storing under barn roofs. It seems to me that when hay is put up in long, narrow ricks, made as high and steep as the wind will allow, built solidly and well up in the middle, it will keep better in every respect than if stored in barns. There are many good reasons for this opinion, but I'll risk the opinion alone this time.

"As to building barns to store small grain, the idea seems almost ridiculous to farmers here, who raise from fifty to one hundred acres every year; it would take a fortune to build such an establishment, and then with our present method of thrashing the grain, would all have to be moved out again when the 'machine' came round. Everybody who has ever farmed in the West knows that well bound, dry wheat can be stacked so as to stand any weather for any length of time, and with no loss worth mentioning, even by a New Hampshire gravel-scratcher, who saves every kernel.

"There is, no doubt, a great amount of hay and grain lost by bad stacking, but I have not very faint recollections of hay in scaffolds in New England ruined by the odors from stables beneath them, and of "mow-burnt" stuff that smelt to heaven from the other side the floor. The fashion of thatching stacks, so common in England and other places, is entirely unnecessary out here. Our dry, windy atmosphere is a sure preventive of mold and must; in fact more hay is spoiled here by being dried to death than in any other way.

"The habit among tidy farmers here is to build ricks instead of round stacks of hay, as they cut better; a slice cut from a round stack exposes it to the danger of being blown over, and I never saw a stack or rick open its whole length to feed from.

"An excellent system for farm buildings is low, snug stables, and sheds for horses and cattle; low, roomy granaries for thrashed grain, never tempting the wind or fire with more than one story, and stack neatly all hay and grain at a safe distance.

"I hope this subject may come up before the Club again."

Mr. Wm. S. Carpenter contended, with the light that he had derived from the cultivation of a hundred acre farm in a rocky region, that no good farmer ever builds stacks, and that it was in the highest degree economical to store everything in barns. He also contended that hay could be stored in a barn in a greener state than in a stack. In short, he is opposed to all stackers and stacking.

Mr. John G. Bergen thought that the gentleman who wrote that letter knew better about the circumstances of that country than we do, and that his system was best there.

Dr. Trimble said that some of the best Pennsylvania farmers stack much of their hay and grain, and if it was as uneconomical as Mr. Carpenter would have everybody believe, he did not think it would be persisted in. Then look at the vast quantity of salt-marsh hay put up in stacks. Would it be economy to build barns to store that?

Mr. Solon Robinson gave a description of western farming, and showed how utterly impossible it would be for men who grow from 100 to 500 acres of grain a year to build barns for its storage. So obvious was the necessity as well as economy of stacking, that he thought a man as hard to be convinced of such an important fact, might have it hammered into him upon an Illinois prairie. What I want, said Mr. R., is that this Club shall not endorse the preposterous notion that stacking is a sign of slovenly farming—that a man must not raise hay and grain unless he has a barn to put it in. We should rather teach people that, although a barn is a convenience, it is not a necessity; and that great prairie farms can be made profitable where all the hay and grain is put up as described in this letter. Even the thrashed grain can be safely stored in rail pens, and it would be almost impossible to find storage for Indian corn in any other way than rail-pens cribs, where it is most abundant.

Dry Salting Pork.

Mr. Pitt—For dry salting, hogs are cut up into flitches and hams. The spare ribs and bald ribs, are usually taken out for immediate use, or, if preferred, only the meaty portion, say about six inches on each side of the backbone, curing the remaining portion of the ribs in the flitch. There is, also, another method of cutting up, viz: into flitches, hams and chines, that is instead of splitting the hog down the backbone, the flitches are cut off about three inches on each side of the backbone (narrowing as the cuts approach the tail), giving a piece the entire length of the hog, from the neck to the tail, which is called the chine; this is divided into four pieces and found when well cured, particularly the neck part, some of the finest joints of the pig. For family purposes, chining is undoubtedly the most durable mode of cutting, as only a sufficiency of fresh meat will be left for present use. The cheeks are also cut off from the other part of the head, and cured for drying, and are esteemed particularly rich.

MODE OF CURING.

Take of salt petre ½ oz. for every 20 pounds of weight of the hog, well pulverized and dried, and apply it evenly on the *flesh* side, thoroughly rubbing it in. In about one hour (to allow of the salt petre to be taken up by the meat), apply by well rubbing in (for much depends on effectually rubbing), a sufficiency of factory filled salt, so as to effectually cover all parts of the meat, first the rind side, then the flesh, leaving thereon, after rubbing about half inch of salt. Lay the flitches on an even surface upon each other, and the hams, chines and chauls, &c., upon them, by which means the brine descending passes through the whole. The salt must be thoroughly dried either before the fire, or in an oven, and is more effective if applied whilst warm. Repeat the rubbing every three days (adding a little fresh salt, the first time), particularly the hams; in three weeks hang up the flitches, chines and chauls, in a moderately warm room to dry. The hams require to remain one week longer under salt, when they also should be hung up to dry.

It is desirable that the curing should be effected as early as possible after the commencement of the cold weather, to allow the meat to become firm and dry before the warm weather in spring sets in. It is well to enclose the hams in bags, the more effectually to protect them from the fly.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

January 19, 1864.

Mr. Nathan C. Ely in the chair.

INSECTS.

The chairman stated that the Swiss government has, during the past year, paid for ten millions of butterflies, and asked if Dr. Trimble had seen the statement.

Dr. Trimble.—I have not. It no doubt was observed by many members of the Club, that during last fall an immense number of moths and butterflies hovered around the trees.

In a trip among the peach orchards of New Jersey, I observed where pear trees had been planted between peach trees, the trees, with very few exceptions, were covered with the webs of the caterpillars, and that small moths were observed as late as the month of November, and no doubt millons of the chrysalis are ready to be hatched out in the spring.

In Newark, we have an immense number of noble elms, rivaling those of New Haven, during the month of September, these trees were covered with these small moths, early in the morning, these trees looked as if they were covered with snow; a small bird preyed upon these insects. I think it useless to spend money in killing these moths. Providence arranges that these insects should live; some years they are in great plenty, in others we hardly see any.

In relation to the time of the seventeen year locusts (*cicada*), coming out of the earth, was not only exact to a day, but to an hour, and in case of its being leap year, the time will come a day earlier.

Mr. John G. Bergen contended that the temperature always regulated the periods, so that the time never could be calculated with certainty in the case of the locusts, nor any other insects. It is heat that warms into life the germs of vegetables and insects. Without it both perish.

Dr. Trimble.—Seeds have a regular fixed period in vegetating, even when the heat is at the exact right temperature, and insects the same.

Mr. Wm. S. Carpenter.—I am surprised to hear the remarks of the gentlemen from New Jersey. I hope to see the day when we shall have a remedy for these pests. It is well known that our farmers have destroyed the birds, and now we are infested with this moth and caterpillar so destructive to our orchards. We have work to do. I hope our farmers will use every known means to destroy them—lighting fires at night in our orchards do a vast deal of good.

In a conversation with a gentleman from Michigan, he stated that these insects were spreading to an alarming extent in that state, so much so, that it was creating considerable excitement. It is useless for us to wait until the Ichneumon fly destroys these worms. The hog will destroy the apple moth.

Dr. Trimble.—As to protecting birds, I have used every means in my power to get the wren to live in my garden, but I have never been able to get more than one pair at a time. The oriole is an excellent bird. I had a pair of these birds with a nest of young ones; they feed very ravenously on these insects, and while the birds were young, they required a great number to satisfy them. I have seen apples remain on the trees until they are ripe, contain these worms, and I have often seen a dish of apples contain a number of them. The moth of the appleworm is very beautiful, although its life is very short, perhaps not longer than a day.

As to the use of fires at night, probably it destroys as many insects useful, as those that are injurious. I have seen persons hang vials filled partly with sweetened water upon these trees; these bottles are often filled with insects, probably there were a number of the Ichneumon fly which were after their prey.

Mr. John G. Bergen.—I would ask the last speaker whether he has abandoned the use of the sheet, which he advocated with such pertinacity some years since, and also whether he discontinues the use of the hog in his orchards.

Dr. Trimble.—I have abandoned nothing. If the insects are so far advanced as to be upon the trees, I use the sheet, but I was not the person who advocated the plan.

A Rare Fibrous Plant—What Was It?

Mr. Robinson stated that during the clearing out of a lot of old papers in the State House at Albany, Mr. Wilson Miller of this city had picked up the report that he held in his hand, which he read as follows:

"Albany, *June* 2, 1812.

"*To the Honorable the Legislature of the State of New York:*

"Gentlemen: Having at the last session done us the honor to appoint us, together with Dr. Benj. De Witt, to examine into the utility and probable value of the discovery made by Charles Whitlow of a plant said to be superior to flax or hemp for all the purposes to which they are adapted, Mr. Whitlow has laid before us (in the absence of Dr. De Witt, who, not having been apprised of his appointment, has not attended), several specimens of the plant. We have taken the opinions of Dr. Edy, and through him of Dr. Mulenburgh (gentlemen who are distinguished for their skill in botany.) These gentlemen severally assert that the plant referred to is of a rare species, and has not been heretofore described by botanists, and that its discovery promises to be very useful. We have also received the testimony of several persons concerned in the manufacture of twine and thread, who concur in declaring that it is superior for those uses to the finest British flax, and greatly so to that of the United States. But we have not yet had the means of examining the plant in its growing state, or of comparing it with others of the same genus, or of consulting (as we wish to do), with Dr. De Witt. We are not, therefore, prepared to report fully on the subject. But, from what has already been made apparent to us of the utility of the discovery, we are induced, at the request of Mr. Whitlow, to recommend a loan to him of money, upon his giving such security as may appear satisfactory (both for the application and the refunding the money so loaned), with a view to his collecting such quantities of the roots and seeds of the plant as may forward, in the shortest possible time, its cultivation, and of the material as to have it manufactured in its various fabrics so early as to enable us to lay specimens of these several articles, together with a more specific report, before the Legislature at its next session.

"Believing that it will be important to a proper knowledge of the value of this plant that this should be done before your honorable body decide upon his request, and believing, from present appearances, that the object may be highly important, and that the loan can be well secured, we are induced to recommend his request to the consideration of the Legislature.

"All which we have the honor respectfully to submit.

"Rob. B. Livingston,
"E. C. Genet."

Now, said Mr. Robinson, it is a matter of curiosity to know what this plant was that attracted the attention of such men more than fifty years ago. Are there any persons living who can give us light upon the subject? Was this plant tried and found unsuitable, or was it overshadowed by cheap cotton, which stopped the cultivation of flax, and has kept a thousand hills barren that but for cotton would have been covered with sheep, furnishing cheap and wholesome clothing in wool and skins, and furnishing the laborers with abundance of meat, and at the same time affording ample remuneration to farmers. So would the cultivation of fibrous plants—this one, so favorably reported upon, perhaps, among others, all of which have been kept back by those who have been willing slaves to slave-owners, who have so long clothed the world with slave-grown cotton.

Samuel Allen Stryker, Ohio, communicates the following information in relation to the above:

"I would refer you to Mr. Benjamin Benson, of Townsend, Huron county, Ohio, who says he was well acquainted with Mr. Charles Whitlow, and has seen the plant. You will find an article on the subject in the Patent Office Reports of 1850, page 310, a portion of which I copy below, in which he says: 'In looking over the Patent Office Reports for 1847, I find, on page 163, under the article *Hemp*, an extract from Niles' Register, Vol. 3, page 188, referring to the plant *Urtica Whitlowi*, discovered by Charles Whitlow, of New York. The plant alluded to underwent, at the time of its discovery, a very critical examination as to its merits and adaptation to the purposes of hemp and flax by the persons or committees appointed for the purpose, and whose investigations were in accordance with the remarks contained in the Register.'

"Mr. B. further says: 'I was well acquainted with Mr. Whitlow, and have seen the plant, together with a piece of the cloth manufactured from it, which was remarkable for its white and silk-like appearance, and also from its uncommon strength. Mr. Whitlow informed me,' says Mr. B., 'that General Macon, then a Representative in Congress, remarked that the discovery was worth the whole contents of the Patent Office.'

"Mr. B., in his description of the plant from recollection, says: 'The plants have radical stems—or, rather, they may be said to be all radical, as there are many springing from the same root. Smooth or glabrous, or dark-purplish red, or dark-mahogany color, the leaf—lanceolate, serrate, acuminate, sessile.'

"'Mr. Whitlow discovered it,' says Mr. B., 'a few miles from the city of New York, on some of the moist grounds so common on the island.'"

THE GRAPE CURE.

Mr. Robinson read an interesting article from a German paper about the "grape cure," as it is practiced at Durkheim, Germany, which will doubtless interest all readers of these reports: "Durkheim is on the bank of the Rhine, in the Bavarian Palatinate, and in distance about 14 miles due east from Manheim. The nearest railroad station is Neustadt, a small town on the line from Mayence to the French frontier at Forbach. The drive from Neustadt to Durkheim, a distance of about nine miles, is very beautiful, and is to be preferred to that from Manheim. The road is a very good one, and runs along parallel to and at the base of the Haardt range of mountains, on a slope which has been formed by the action of water on the light, sandy, and friable soil of those hills. From a few miles to the north of Durkheim to about 20 miles to the south, the Haardt range of mountains on the east side runs almost due north and south, leaving an immense flat plain of about 12 to 14 miles in breadth, intervening between it and the Rhine. This plain is very highly cultivated, and abounds in every sort of crop. The Haardt range is considered to terminate in the neighborhood of Landau, the mountain on the south side of the stream which flows through that town being properly the Vosges, though the one range is merely a continuation of the other. A slope of the same character, due to the same causes as the one on which the road from Durkheim to Neustadt runs, extends from Neustadt to the southern limit of the Haardt range at Landau. The geological character of this slope is different from that of the great plain which extends to the Rhine, the latter being either tertiary or alluvium, while the slope is formed of the detritus that has been washed down from the hills. The whole face of this slope is covered with vines. The vine cultivation is on so enormous a scale that nothing in Germany, not even in the Rheingau, from whence the most celebrated of the German wines come, can be compared to it in extent. For some five-and-twenty miles the highroad passes through the midst of a succession of vineyards, without a trace of any other cultivation meeting the eye of the traveler. Though the wines of this district do not command such high prices as the wines from the Rheingau, and are not very extensively known out of Germany, the cultivation is conducted with as much care as in the Rheingau itself, and the wines produced are more generally consumed by the Germans themselves than any other of their wines. The Reidesheimer, and the Forster are the best of these wines, and immense quantities of them are sent to all parts of Germany, and since the last few years to the United States. The former is usually recommended by the German doctors to their patients as being the least acid of their wines. The vineyard from which these two wines come is in the immediate neighborhood of Durkheim. A very good class of wine is made at Durkheim, but the grapes grown there are for the most part table-grapes, as the Germans say, to be used in the grape-cure and for the purpose of export. Immense quantities of them are sent daily to all parts of Germany, and no grapes enjoy so high a reputation in that country. Grapes differ materially from each other in quality; the grape which is best adapted for the purpose of making wine is not generally so wholesome and so agreeable to the taste as another which will produce an inferior wine. About 12 to 15 different sorts of grapes are grown at Durkheim. Many of these, if not most of them, may be often found in the same vineyard. A little practice will enable any one in a very short time to distinguish, by the eye, one sort from the other; for differences exist between them not only in color, but also in form and size, as well as in the thickness of the skins. The leaves, also, of the different sorts differ in form and size. To the taste the differences of flavor are at once perceptible. Persons who have not been through a vineyard, and have not had the opportunity of testing one different sort of grape after another, can hardly believe that there is so great a difference in the flavor between the different sorts as does, in fact, exist. The grapes used in the cure are generally of four or five sorts; the two most commonly employed are called the Gutedel, and the Austrian. They are both white, with thin skins, and are both of them sweet and well-flavored. The black Burgundy grape, and the small dark red Traminer, which has been introduced from Tyrol, are also much used in the cure, though not nearly to the same extent as the two already mentioned. The Burgundy grape is a very fine grape, and, both in flavor and look, very like what is called here the Black Hamburg. The Traminer is a very pleasant sweet grape, with a scented or aromatic flavor, and a very thick skin. In certain cases it is found to disagree with patients, it being too heating. The Riessling, the grape from which all the most celebrated wines of the Rheingau are made, is not used in the cure, and is not considered by the Germans as a good table grape. Chemical analysis shows that it contains more saccharine matter than either the Gutedel or the Austrian grape ; but, at the same time, its acid properties are stronger. The Burgundy grape is still sweeter than the Riessling, but its acid qualities, though less than those in the Riessling, are greater than those in the Gutedel or the Austrian, and therefore it is not so much used in the cure as they are. The acids which are found in the juice of all grapes, in greater or less proportions, are tartaric, citric, and malic acids. Much albumen, gelatine, and gum, as well as a considerable quantity of alkaline matter, are always found. Careful analysis has also discovered in all grape juice traces of tannin, and even oxide of iron. An excess of acids in the grape is found not only to interfere with the digestion, but to affect the mouth and teeth in such a way as to prevent a person from being able to continue the cure for the requisite period. "The grape cure lasts from three to six weeks. The regular season commences, on an average, about the middle of the first week in September, and lasts to nearly the end of October. Everything depends on the state of the ripeness of the grapes. The amount of grapes daily taken by persons undergoing the cure varies from about four and a half to seven or eight pounds ; in some cases even as much as nine pounds is eaten. They are taken three times a day, at the same hours at which mineral water are drunk in Germany ; before breakfast, at 11 o'clock in the morning, or two hours before dinner, and from 5 to 6 in the evening. Persons generally commence the cure with from two to three pounds a day, and advance daily quantity till the large limit is reached. The skins and seeds should not be swallowed. The largest portion is usually consumed at 11 o'clock. Some doctors do not allow their patients to take any other breakfast than the grapes, accompanied by a roll of bread. The usual plan, however, is to permit them to take a breakfast of tea or coffee with bread, but no butter, after the grapes. A strict diet is universally prescribed ; all fat, sour, or spiced meats and pastry, are forbidden ; a small quantity of white light wines is permitted, but red wines, beer and milk, must be avoided. The evening meal should be a very light one. The system pursued at Durkheim is the same as one followed at the other places where the grape cure goes on ; and the grapes which are used in the cure both at Vevay and Montreux are, as at Durkheim, for the most part the Gutedel and the Austrian varieties."

Several members expressed opinions upon this statement—that it would tend to promote grape culture in this country as a sanitary measure. Those who are opposed to growing grapes for wine can grow them for health, to be used instead of drugs for the afflicted.

RHUBARB WINE.

Mr. James Seely writes from Caroline, Tompkins county, as follows : "Is it not a fact that rhubarb wine, so far as profit is concerned, is established? If this wine possesses comparatively no intrinsic merit, and yet from its cheapness and comparatively healthful nature, supplies a common want without practically interfering with grape-wine manufacture, should it not be recommended as likely to discourage the use of drugged and poisonous liquors? Is not the fact indisputable that its merits incite a demand equal to the constantly and rapidly-increasing manufacture, at prices leaving a munificent margin of profit to the producer, and will it not be some time before people familiar with the whole matter will believe it a speculative juggle?

"It seems to me the best practical test of quality is that the consumer is satisfied. But it may be urged that, to the educated palate of the best wine judges, compared to the best qualities of grape-wine, it is a nauseous, worthless compound.

"The question may arise, however, whether they are the best judges of the general want. There are other considerations than mere taste, which go far to decide the choice of the public, even if all possessed a like accurate discrimination.

"The difference of cost of grape and rhubarb wine is an item to which no American is insensible. Add to this the not infrequent depravity and morbidity of taste which enables a large class of people to endure the preparations called lager-beer, ale, &c., and grape-wine is put at an exceedingly embarrassing discount in the common market.

"Now, I have no pecuniary interest in the matter—not having engaged in its manufacture or sale; neither am I interested in grape-wine manufacture pecuniarily. I say this, because the seeming haste used in the Club in condemning it tends to excite a suspicion that jealousy of a rival business, rather than sound judgment, was paramount.

"I cannot think, however, that any just ground for jealousy exists, but rather the contrary."

Mr. John G. Bergen.—I recollect that Mr. Robinson was one of the earliest advocates of the culture of rhubarb for wine, and that he presented a bottle to the Club as American sherry, which was drank by several who professed to be good judges, and pronounced excellent, and that he then astonished them with the assurance that it had not a drop of grape juice in its composition. I should like to know if he has changed his opinion.

Mr. Solon Robinson.—No. And, so far as I am concerned, Mr. Seeley is mistaken in supposing that I have condemned it. I have only condemned the dishonest representations of knaves who sell roots of "the wine plant," representing it as something peculiar, and the only variety that will make wine. All of the cultivated varieties of the common garden "pie-plant" (rhubarb) will make this kind of wine, and one about as good as another. One sort may afford more juice than some other, and for this it is probable that Cahoon's seedling, which is a coarse, strong-growing sort, would give the greatest yield per acre. And, speaking of seedlings, reminds me that it is not necessary to go to the expense of getting roots to establish a rhubarb plantation for wine-making. Buy the seed and grow the plants, and if you do not get "Linnæus" or "Victoria," you may get a seedling equal to either, or better than Cahoon's or Downing's seedlings, or at any rate you will get cheap plants that will afford juice and save you from being cheated in buying "wine plants," which, perhaps, you already have growing in your garden.

Of rhubarb plants a beverage can be made to take the place of cider, in sections where apples have entirely failed ; as is the case in Northern Vermont; and also where grapes cannot be ripened for wine, and in such localities, I recommend people to plant rhubarb, but do not be cheated by wine-plant peddlers. They are humbugs, not the plant.

Dr. Trimble.—We are very apt to run from one train of subjects to another. We discuss the benefit of the grape for a disease without knowing what the disease is. The other is wine. We are continually bringing this subject before the club. We are like those persons who set for hours at the dinner table discussing the flavor of various wines, we shall be considered as regular wine bibbers.

Mr. R. H. Williams.—I have generally agreed with Dr. Trimble in his remarks before the Club, but on this subject I must differ with him. Brandy and wine is an excellent food, and combines all the elements that will make a person robust and healthy. We are a people that live to eat, but I think if we eat the produce of our fields and drink the pure juice of the grape, we shall find our healths improving and stimulated to greater efforts.

From my experience I think the reason why the people of Germany use the grape cure is, that these persons have been in the habit of the free use of wine, and when they can no longer use wine, they eat the grape, from which the wine is made.

GUTTA-PERCHA PAINT.

The Chairman.—Last week we had a letter of inquiry about the value of gutta-percha paint. The following is a very satisfactory answer, from a very trustworthy man :

"James B. Bradley, of Bridgport, Conn., painted for me in May and June, 1860, several tin roofs, with what he called "Patent India Rubber and Gutta-Percha Roof Paint,' the job amounting to $128.94. He had an abundant quantity of recommendations as to himself and his 'Gutta Percha and India Rubber Paint.' He gave me a written warranty, which is here in my hand, warranting it for seven years to stand and be tight. In less than two years the rust from the tin in places attracted my notice, and on examination I found the paint nearly all washed off, and have had all painted with ground paint-skins, which is the best roof paint I have ever used."

LUPINE.

Mr. John Lowrey, from Saratoga Springs, N. Y., writes a letter of inquiry about the lupine, whether it has been tried with success in this country, and where seed can be obtained. The answer to this is, that so far as this club have knowledge, it has not been tried to any considerable extent, though often recommended for such land as that around Saratoga Springs. In Europe it grows in light sand that will produce no other crop. Portugal has fleen highly benefitted by lupine. It grows rapidly, and draws sustenance from far below the surface, and is not, therefore, affected by drouth. It is sown near Paris, about the middle of April, and used as a soiling plant. The seed can be obtained of large seedsmen in New York.

WHY GROW HORNS UPON SHEEP?

A Michigan farmer wants the Club to discuss the question, "Why we should grow horns upon sheep? What is their use? Are there Spanish Merinos without horns? or, if not, could they not be bred without? Does it not cost as much feed to grow a large set of horns, as it does two pounds of wool? Then would it not be more profitable to grow wool or meat, instead of worthless horns? And if grown without horns, so that when they fight they would not injure themselves, why not, where grown almost exclusively for wool, keep the bucks without castrating, since they produce more wool than wethers? What would be the value of sheep carcases, say old, worthless rams, to feed to hogs.

As these are all important questions, and as no practical shepherds were present, we print them in hopes of eliciting answers from outside members of the Farmers' Club.

The writer calls up the question about horns upon the bovine race, and defines any one to prove them of value. He has reason to be opposed to them, for he says: "My father was nearly killed by a cow's horns. One of my neighbors had a large hole hooked in his body this spring, and I have a fine young horse much injured by an ox a short time ago. I consider horns on cattle a nuisance, and shall raise no more cattle with them on. From what I can learn from books, I think I should like the Galloway cattle, if the cows are good fair milkers. Would they be a good breed here for beef and milk?"

Mr. Solon Robinson—I think that we can answer yes to both of these questions. There are a good many of this excellent breed of cattle in Canada West.

INQUIRIES ABOUT FENCES.

Our Michigan friend asks the following questions: "I want to make durable fences. I have stone but not enough to make a high fence. 1. Could I place large stones where I want posts, and drill holes eight to ten inches, and fasten wrought or cast-iron posts solid by melting lead around, and fasten the boards with wires through holes? I should have the bottom board two and a half feet from the ground, and fill up with stones or sod, so the iron post need not be over three or three and a half feet long? 2. Can a substantial fence be made on such a plan? I was out to Iowa this fall, and on the way I saw considerable white willow. It is a splendid tree, and no humbug. I should fence my farm with it even here, if I was not afraid it would impoverish the adjoining land so as to prevent raising good crops for several rods on each side of the fence. 3. What does the Club think on that point?"

Mr. Solon Robinson.—It thinks, first: That you can make a cheap, substantial fence in this way. You may also fasten wooden posts to the stones by one or two iron pins, made so as to drive in the drilled hole solidly, and having the upper end pointed, and made rough on the sides so as to drive in the posts and hold fast.

2. The fence would be more substantial, probably, with wooden than with iron posts, as boards nailed on would make a stiffer structure than fastened otherwise.

3. The Club think just as you do, that there is danger upon this point, in fencing with white willow, or any other large-rooted tree.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

January 26, 1864.

Mr. Nathan C. Ely in the chair.

A New Year's Greeting.

Mr. Solon Robinson.—I hold in my hand a letter from a young lady that is so full of pleasant sunshine, although written in one of the coldest days of a borean region, that I think the club will be amused and instructed by its pleasant gossip. I should have introduced it a week or two since, if I could have had the opportunity. It is from Almira L. Bliss, written Jan. 1, 1864, from Antioch, Lake county, Ill. This county lies along the shore of Lake Michigan, north of Chicago, where it gets the full force of all northerly winds, and also has the advantage of a great body of water which never freezes. Her letter is addressed "Dear Farmers' Club." This is only an item to show how much farmers and farmers' wives and daughter, appreciate discussions of matters intended to throw light upon the pursuits of their life. I will now read the letter :

"I send you my wishes for a 'Happy New Year.' May your members never be behind time. May their numbers never grow less or their sayings less readable. May you receive the first and finest of fruits and flowers to test and report upon, that we far-away people may know which are most profitable and desirable. May you continue to expose the doings of humbug, and perhaps a few of the 'heathen' may heed. May you never be troubled with 'sour grapes,' wilted apples or gritty pears. And last, but not least, may the report of your sayings and doings shine abroad over our united land, from the Atlantic to the Pacific, from the Great Lakes to the Gulf of Mexico, with a light so much brighter and clearer than 'moonshine,' that plants and trees may show the effects in greater vigor and productiveness. If these wishes of mine should seem 'to rattle together like stones,' do not wonder, for the mercury stands 20 degrees below zero. The snow resembles sand in all except color, and is driven about in all directions by a fierce north-west wind. Northern and southern roads in many places are level full of snow from fence to fence. Sometimes in a field a drift commences at almost bare ground, and slopes upward until it reaches clear over the top of the fence. The wind is so penetrating and so snow-laden, that barns and sheds that are not air-tight are but little protection. My father, whose boyhood lies in the beginning of 1800, says the present weather is unparalleled in his recollection. This morning at 8 o'clock, the mercury stood at 25 degrees below zero. The wind is still as high as ever, and though the mercury has risen 6 degrees, we are hoping that the wind will cease, lest we lose all our fowls and animals, too. To-day my father brought in a bushel basket full of dead hens, and reported more freezing.

"We crawl around the red-hot stove, and 'sigh for a sunnier clime.'" We live in the south-east corner of Wisconsin, close to the State line. But this is not what I took my pen for to-night. Two years ago, or rather in the spring of 1862, my brother planted 200 Isabella grape roots. The plants were grown from cuttings, and were planted on a rather stiff, clayey loam, with a clay subsoil, without under-draining, and with no other preparation than manuring and plowing. They throve finely the first season, some of them making twenty feet of growth.

"Last spring, only about twenty started, and some of them, after making a few feeble efforts to go on, dried up and died. Pulling them up, we found the large roots dead, barkless and fiberless. We thought, perhaps they died of wet feet. (1) What is our respected Club's opinion ? We have raised grapes, to some extent for several years, and have seldom lost a vine before. We have raised Isabella and Catawba, but the season is scarcely long enough for even the Isabella.

"The autumn of 1861 was long, warm and dry, and the Isabella ripened well, in fact better than before or since. They were pronounced by good judges superior to any Isabellas ever before eaten. 1862 was a very poor grape year. The season was cold and cloudy, and the frosts came on before the grapes were half ripened, and froze them hard.

"The past season has been tolerable ; long enough to give most of the grapes a good color, if not a good flavor. At the time of gathering the Catawbas were pronounced green and sour beside the Isabellas, but at the end of two weeks the Catawbas were much improved—were sprightly, excellent, and the Isabellas insipid. We can expect only uncertain results from grapes here at best.

"The slug mentioned in the report of a previous meeting of the Club, appeared here for the first time last summer, the last of June and the 1st of July. They were quite numerous, eating all the green of the leaves of some trees. When I found out what they were, I searched for some to preserve until next spring, when, I was told, the perfect winged insect would appear. But my brother dusted the trees with ashes the day before, and not a slug could I find afterward. I almost forgot to say they were seen only on dwarf pear trees. There were two colors ; one was snail color, and the other was a dull yellowish color.

"For the benefit of some of my sisters, who perhaps may be as ignorant as I was two years ago, I would say something of my especial pets, flowers. I always loved the frail things, and I well remember my pride over my first flower-bed, which was about a foot square under a currant bush. I increased my flower garden from year to year, and enriched it by such exchanges as I could make with the simple gardens of my acquaintances. I had a habit, too, of digging whatever pretty flowers I found in the woods and meadows, and bringing them home and cultivating them. Our native flora contains some desirable plants and flowers, but their numbers are every year decreasing.

"Yet I was not satisfied. I desired a more valuable collection ; and I was often vexed by reading in agricultural papers articles describing new and beautiful flowers, but leaving the reader in ignorance of where seeds or cuttings might be obtained. In 1862, I sent to the Patent Office for seeds, and received about twenty or thirty papers. I was teaching some miles from home, but I sowed part of the seeds, and the plants throve finely; but I finished my school and returned home before they blossomed. About that time I saw Mr. B. K. Bliss's flower-seed catalogue mentioned in the Club, and sent for a catalogue, and afterwards for seeds, the principal of which were balsams and pansies. I sowed these seeds last spring, 1863, together with the remainder of the seeds I received from the Patent Office, "I presume many of the Patent-Office seeds had lost their vitality, as but few of them grew. The only ones of value were mixed snapdragons (antirrhinums) of numerous shades of crimson, pink, white, yellow, and several variegated varieties. They were not sown until late, and many of them gave abundance of rich spikes of bloom this fall. These are biennials, and have the appearance of being hardy enough to withstand even our winters. The Chinese pinks I prized highly, as they blossomed early, and the flowers were very large and double. I had eight shades of pink and crimson, all white-edged and barred with black across the petals. These were biennials and blossomed until frost, when I cut them close to the ground and covered them slightly. The carnation pinks have not yet blossomed. I expect rich and fragrant flowers from them, if they survive the winter. So much for my Patent-Office seeds. My balsams, though I got only a five-cent paper of seed, gave me great satisfaction. About a fourth of the plants proved double, and the blossoms were very large, and as double as roses. I thinned out the rows by transplanting, leaving the plants about six inches apart, which was too close. (2) Those left standing blossomed first, but the transplanted ones were superior to the others, because moving them dwarfed the plants and the foliage, therefore showing the bloom to greater advantage. A very fine effect may be obtained from simply a bed of balsams, for there is a great variety of colors, and they are very bright and showy, and continue in bloom a long time. My pansies gave me more pleasure with their large, velvety, many-colored eyes, than did the gayer balsams. The balsams are quite tender—a slight frost being sufficient to kill them—while the pinks and pansies bore quite severe frosts without apparent injury, and the pansy blossoms are buried under the snow, ready to smile whenever the sun reaches them again. I am writing not to those who have gardeners and gardens large and can buy any plants they choose, but to those who, like myself, depend for flowers on their own personal attentions to seeds and plants, and who deem it a pleasure to soil their fingers in the brown mold, if it will make a leaf greener or a flower larger and brighter.

"The golden bartonia, called by some California gold-cup, I consider desirable in a small collection of flowers, for it has large single flowers, of a bright golden color, and a beautiful satiny appearance. The double stocks, or stock gilly, is especially valuable on account of its long blooming, which is until after very severe frosts. I have only a purple variety. If you wish flowers to continue long in bloom, do not let them go to seed.

" (3) I would have farmers' girls, all over the country, cultivate flowers. If it is only a bit of ground three feet square, plant it with the best seeds you can get, and after they are up, *do not forget to care for them yourselves.* They will give you double pleasure, if you tend them with your own hands. But do not be afraid of soiling your fingers. If you are, I am afraid your flowers will grow but feebly. If you cannot get such as you would like, do the best you can with what you have. Good care and tasteful arrangement will make even the commonest flowers look well; and do not despise a pretty flower because it grows in the forest. And, fathers and brothers, do not be afraid to grant a patch of ground to your daughters and sisters to grow such 'trash' upon.

"(4) If they succeed with their flowers, depend upon it your fruit and vegetable garden will come in for their share of attention. Nor will this be all; taste and comfort will stop with you more often, and health will reside under your roof.

"I have waited long before writing, hoping that some one more competent would speak first on the 'flower question.' (5) Now I hope to hear from others who love flowers, that I may learn, for I feel very ignorant. And you, dear, wise Club, that is growing so impatient and severe because of this long letter, (6) will you not spare time occasionally to read such letters and discuss such matters for our benefit?

"In conclusion, I would only say that I wish to exchange the accompanying fresh seeds of stocks, pansies, Chinese pinks, snapdragons, and bartonias, with some kind friend for any other varieties of stocks, or for any of these : Asters, Japan or carnation pinks, petunias, perennial larkspurs, salpiglossis, salvia, or others. To those wishing trustworthy flower-seeds—those away in the 'backwoods,' as it were—I would say, send a stamp to B. K. Bliss, Springfield, Mass., and get his flower-seed, catalogue, and see what you can have brought right to your post-office. Do not imagine, from the similarity of names, that I am interested in selling seeds for this gentleman ; but I am interested to have every one enjoy the pure pleasure of flower culture, and I have found seeds from this source trustworthy ; and, more than that, the smallest orders are filled immediately. Any one who will be kind enough to exchange seeds with me may give them to Uncle Sam's mail."

After some discussion by various members :

1. The opinion of the Club is unanimous upon this point, that grape vines cannot remain healthy in any climate if the roots penetrate into a subsoil filled with water ; and in a region as cold as the one described in this letter, the roots will be frozen in ice in winter, and stand in stagnated water in summer. In such a place it is surprising that any fruit can be obtained. If the clay soil was under-drained, or if the vines were planted upon hillsides, or upon sandy soil, there is no doubt but grapes can be grown upon the west side of Lake Michigan as well as upon the shores of Lake Erie.

2. Here is a lesson in flower cultivation, that others will do well to observe. Transplanting often improves the blossoms. Her address, too, to those who soil their own fingers to grow their own flowers, is sweetly fragrant. It is the opinion of this club that it will make many a leaf greener and many a flower brighter.

3. So would we. There is no one thing that will tend more to form a lovely character, in a country girl, than a love of flowers. With it the love of everything that is beautiful grows with her growth. May they all be incited to it by reading this flowery letter.

4. We pray every farmer to read and consider well this truth. Just as much truth as though he read it in a holy book.

5. So do we, not that we think the writer so "very ignorant," but the ex-

perience of each may teach others, who need the effect of just such letters as this to set them going.

6. Yes. At least he who received and read, and reports this letter, will take time to read others, and provoke discussion, so long as it will tend to make one flower blossom where none blossomed before.

Plant Lice.

Mr. R. T. Ostrander, Geneva, Wis , reiterates the opinion that the aphides or plant lice are nothing but infant ants.

Doctor Trimble—Such an idea as this, that the aphides are the young of pismires, would be entirely too contemptible for us to notice, if it was not for the fact that such teaching may cause children to imbibe the idea that what he says is true. If any one will carefully watch these little insects he will see them propagating their own species instead of being propagated by ants. He will also see them change their coats, just as several other animals do, and he will also learn why the ants are present where there is a colony of aphides. They exude a very minute drop of sweet liquid, which the ants are fond of, and on account of which they have been called the ant's cows. For the ants pass around among the aphides and touch them gently, upon which the little insects give forth the food that the ants are after, and this is called "milking their cows." You might as well suppose that a snake's eggs would produce birds, as that these little insects are the infant pismires. It is very easy to learn the truth ; but perhaps it is easier to assert a very foolish lie ; we hope nobody will believe this one.

Corn-stalk Cutters.

Mr. John Atkinson, Bethany, Brooke Co., W. Va., wants Mr. Carpenter "to say where the corrugated rollers, with which he chaffs his corn-cut fodder, are to be had."

Mr. Wm. S. Carpenter answers, in any of the agricultural warehouses of this city.

Mr. Solon Robinson.—And probably in almost any other city.

Improved Grain Drills.

Mr. James Green, writes from Kennett Square, Pa., that he has made an improvement in grain drills, and "that he is too poor to advertise it." There have been a great many poor mechanics made rich by advertising. If he has made a real improvement, and will take a sensible course to make it known, we will guarantee that he will not always write himself down "a poor merchanic."

The Meat Rations of the People of New York.

Mr. T. C. Peters, Darien, New York, says :

" A close study of the tables of receipts of butchers' animals in New York, and several years' observation, satisfy me that the annual consumption of butchers' meat is a very good criterion for judging of the density of population around the markets thus supplied.

"You make the whole quantity of meat supplied for the year 1863 as equal to 379,124,697 lb; but you also state that large numbers of carcasses are received which do not find their way into any reports. I assume the quantity thus received to be about 20,000,000 lb, making the aggregate equal to 400,000,000 lb. This will give a daily consumption of 1,095,863 lb.

"I am satisfied by examination of the *statistics* of housekeeping of many city families, the average daily consumption of fresh meat is equal to half a pound a person, or three pounds to a family. This would be a small allowance, but for the large amount of fish, poultry and game also consumed.

"Allowing, then, half a pound of meat to a person, and your markets issue a *meat ration* to 2,191,726 persons daily.

"But you will say the census shows no such number of people, and therefore the census gives a very imperfect idea of the vast congregation that eat and sleep within ten miles of your City Hall.

"Outside of that circle 200,000 will cover the number of people who draw their daily supply from the city markets.

"This leaves 2,000,000 as the number of people resident within the limits of the city markets. The quantity taken for the army for the navy, for the commercial marine, I assume as equal to the supply of 100,000 persons daily, and it will not exceed that. I will also allow that the transient people fed daily are equal to 200,000 men—and there is still a population in New York and Brooklyn, and their immediate dependencies, of about 700,000 beyond the census returns of 1860.

"I have no doubt you are feeding a resident population from your markets of over a million and a half of people."

Mad Itch in Cattle.

Mr. W. L. Koons, Rochester, Fulton County Ind., says: "The mad itch prevails here now. Three years ago one of my neighbors lost three valuable cows by it. Can the Club answer what is the cause of the disease, and what the cure?"

How Late Should Corn be Plowed.

Mr. Koons also asks the following question: How late in the season or at what stage or period in the growth of corn as the latest would you recommend the plowing of it?

Mr. Wm. S. Carpenter advocated plowing it as late as he could without danger of breaking it down. He works his up to the time of tasseling, and thinks the crop very much improved by that course.

Mr. Solon Robinson would use a turning plow but very little in corn. He would at first, and up to the time it is large enough for second hoeing, use Mape's subsoil lifter, and the horse-hoe. After the corn is large enough to fill the ground with roots, he would not use any plow that would brake the roots, but would keep the surface clean with a horse hoe or shovel plow just as long as it would be safe to work a horse between the roots.

When to Cut Timber for Durability.

Mr. Koons asks: "At what particular period or season would you recommend the cutting of timber, with reference to its greatest durability?"

The Chairman said, it is a question of the utmost importance, to all farmers, as it is a still mooted question among them whether timber will last longest cut in summer or in winter.

I have lately been engaged building a dock at my place in Connecticut, and this question is one that has arisen, and I find that most farmers are in favor of winter. I have had timber cut at both seasons, with a view to test the question of greatest durability.

Mr. S. P. Dow, New Market, N. H.—The late Gov. Plumer, of this State, one of the most practical men of his *time*, made it a *point*, for the last thirty years of his life to cut all his stakes, poles and rails, fencing, also his fire wood—the last week in August, or first week in September,—he said it would last twice as long, and the fire wood,—season perfectly and bright.

I have been in the business of cutting wood, timber and lumber for the last twenty years, and know from experience that fire, or cord wood, cut from 1st September to 1st January, always, cures, or seasons, bright and perfect—that the wood cut in February, March or April, *never* will cure or season, and does not burn well. Any farmer can easily test it by going into his forest 1st September and fall a beach or birch tree, go in to same growth in March or April and fall another same kind, let them both remain on the ground until the next fall or 1st November—he will then find that the limbs of the one fallen in September will be seared hard, like horn, not easily *cut* off—the other will be so decayed that he can easily knock off the limbs with the pole of his axe.

The sap is fully matured in wood 1st September, in this latitude.

Mr. R. H. Williams thought if the timber was treated exactly alike in regard to season, it would not make much difference whether cut in February or June, but would prefer to cut in winter.

Mr. Wm. S. Carpenter.—As the wood is full of sap it must naturally rot quicker when cut in summer than in winter.

Mr. Solon Robinson said that many careful experiments have been made and reported within a few years, which have entirely exploded the old notion that timber, for durability, must be cut in winter, as it has been proved that that cut in summer is much the best for building ships, bridges, &c. Of course, it would be the best for making fence rails. As some of the speakers have already suggested, it should be stripped of its bark, and the sooner it seasons the better for its durability.

Dr. Trimble related some interesting incidents about the durability of the ancient cypress trees of North Carolina, out of which shingles are made, after having been buried several centuries. Adjourned.

John W. Chambers, *Secretary*.

February 2, 1864.

Mr. Nathan C. Ely in the chair.

TURNIPS.

The Chairman exhibited two sorts of round turnip, one of a yellow color, and the other a red-top white. The first, he said, a neighbor assured him was valuable for feed, and gave a yellow color to butter; but the other was not esteemed, and he called for an expression of members on this question.

Dr. Trimble said that he grew a large crop of turnips one year, too far from market to make it an object to sell them, and he was afraid to feed them to cows on account of the taste imparted to milk; but upon the recommendation to try a very small quantity at first, and gradually increase it, he had adopted that plan, and they did the cows good and did not injure the milk.

Prof. Mapes said that the practice upon his farm for a number of years had been to grow a large crop of turnips, and they were regularly fed to cows without injury to the milk, by simply adopting this rule—to feed immediately after milking, and at no other time. Both of the varieties upon the table are valuable—the red strap for early and the yellow for late feeding.

Mr. R. H. Williams said that it was the tops, and not the roots that affected the milk; to which Prof. Mapes replied that he had never found any bad effect from tops, which, at the time of pulling, formed almost exclusively the feed of cows, simply observing the above rule.

Mr. Solon Robinson.—"What nice, sweet, yellow butter. How do you make it in winter?" This remark has been repeated at my table this winter. The answer is by feeding turnips—just such turnips as that red top one. Such I have fed for several years, and find very valuable feed. We get rid of the turnip taste in the milk, by reading agricultural papers. Some one wrote in *The Country Gentleman*, that niter (saltpeter) would disinfect the milk of all turnip odor and taste. Make a solution of niter; keep it in a bottle and put a table spoonful in the pail before milking. That is enough for a pailful of milk. We tried it—found it effectual, and now have nice, sweet butter.

RESIDUUM IN PORT-WINE BOTTLES.

The Chairman exhibited a lump of plum-colored substance, with a strong port wine odor, which appeared as though it might have been composed of finely ground logwood and clay, moistened and made into a mass and partially dried and then broken into lumps. He stated that it was a sample of the residuum several inches deep, found in a port-wine cask, and wanted to know if that was what such wine was made of.

Prof. Mapes said that this was no certain sign of adulteration, as it may be a crude cream of tartar, combined with the fine portion of the grapes, which are mashed somewhat finely to make port-wine, which, when first brought into market, is not in a drinkable condition, being too astringent, and somewhat muddy. In its then pure condition, it would show a very large residuum resembling this substance. This wine is then mixed with the red Catalonia wine, which is a lighter variety, and that forms the port-wine of commerce, and the casks containing it, which never have been adulterated, will show such a bottom, after standing a long time, when the wine is drawn off and it has time to dry till it will break up. A cider barrel might show something to compare with this. Sherry wine is made by reduction in the same way as port—the original being brought to market in goat skins, which sometimes impart a flavor which makers of spurious wines try to imitate, to prove that it is genuine.

BLACK KNOT.

Dr. Trimble.—Last week Mr. Prince gave the names of forty plums, which he said were never affected by the black knot. One of the exempts was the Bolmar. Here is the answer to that statement. Here are a lot of black knots which I cut from a tree that I know to be a Bolmar.

FARMING UNDER DIFFICULTIES.

Mr. John Hacker from Portland, Me., writes such a humorous letter about farming under difficulties, that we must give it entire, because it is difficult to see what we could prune out. It is a brave man who can write down his own failures for the benefit of others:

"MR. FARMERS' CLUB: Having read the reports of your discussions with much interest, and, I trust, with some profit, I take the liberty to give you some statement of my experiments and failures, hoping that, from the remarks they may elicit, to gain further information which may lead to better success in the future.

"The war having knocked my usual employment on the head, I was induced to make the attempt to draw subsistence for myself and an invalid companion from the earth, and accordingly secured the use of a small farm of land naturally good, but which had been mowed during the lifetime of the 'oldest inhabitant,' without being plowed or manured, and consequently pretty thoroughly worn out. I plowed in the fall as deep as the largest plow would operate, and the frosts of winter pulverized the earth finely. In the spring, I put on all the barn manure that I had time and means to get together, and put in my seed. I planted over 3,000 hills of cabbages, of an excellent variety, that head well without being transplanted, putting from five to ten seeds in a hill. They came up finely, looking strong and green, but no sooner were they out of ground than they were covered with flocks of small black or dark-brown fleas, that commenced feeding on the leaves. I sprinkled them well with air-slaked lime and ashes, which I think had some effect on the teeth of the varmints, for after that the plants did not disappear quite so fast. However, the work of destruction still went on, when I brought up salt-water from the wharf and gave them a drenching. From this time but few fleas were seen; but whether salt had scattered them, or whether the plants had become too tough for them, I do not know. But few plants were left, and I replaced them by some that I bought, and nursed them carefully; but as soon as they had begun to give fair promise, white maggots commenced a 'raid' on their roots. This killed a large number of them, and made others pale and sickly. After the maggots had left the roots, lice in millions commenced operations on their leaves ; and the result was that from more than 3,000 hills I harvested about 100 fair heads, but a portion of these were burst open, and had to be disposed of at a low price.

SWEET CORN.

"I planted a patch of sweet corn, manured in the hill with the cleanings of a hog-pen. Half of it never came up, and half that did come up looked all summer as though it had the consumption. Part of it did well, but just as it was maturing enough to eat, an army of skunks took possession of the field every night, and, instead of selling corn enough to pay my taxes, as I had anticipated, I hardly got enough for my own use.

BEETS AND MICE.

"I planted a large quantity of beets. Some of the common long blood beets were very large, measuring twenty-one inches in circumference and weighing eighteen pounds each, and were very tender and sweet ; but before they were harvested a varmint of the mouse family, dirty-brown color, with thick body, short mane, legs, and tail (is it the gopher ?) took possession of the field and destroyed a large portion of the crop. These 'rebels' burrowed in the ground among the beets, ate into them under ground or just at the surface, and left nothing but a shell of the beet. The same pests destroyed peas, and often ate every potato in the hill. I tried various ways to get rid of them, but could not make them 'skedaddle,' and now in winter they are gnawing the bark from my thimbleberry bushes.

PEAS, BEANS, AND TURKEYS.

"I planted peas among my potatoes, dropping two to four in each hill, and found that hoeing improved their size very much. When ripe, I pulled and spread the vines on the grass to dry. The next morning, when I went to the farm, which is a mile from my dwelling, I found an army of forty-four turkeys feeding on my peas. I drove the long-necks home to the owner, and requested him to take care of them ; but they often returned, devoured my pole beans as high as their long legs and necks could reach, damaged my cabbages, and several bushels of Baldwin apples.

POTATOES.

"I planted potatoes enough to raise 200 bushels, but, in consequence of the rot, got only 40 bushels of sound ones.

FRUIT TREES.

"In the neighborhood are several old orchards, neglected by their owners, their trunks filled with borers, and their limbs covered with all manner of vermin, and these pests are taking possession of my young trees set out three years ago.

HUMAN THIEVES.

"I have currant bushes that bear two boxes on a limb. Animals in the human shape enter the field by night and cut up these bushes, loaded with fruit, and carry them off.

PEAR THIEVES.

"I have a row of dwarf pear trees that bear from half a peck to half a bushel each. Human animals visit these in the night and rob them of the fruit, and in climbing the young trees to feel after the fruit in the dark, they have broken down the limbs till the trees are nearly ruined.

"Now, gentlemen, having stated a few of the enemies that make farming an up-hill business, which ought to be all the way down hill, with pleasure and profit, I will thank you heartily if you will tell me how to get rid of any or all these enemies, from the cabbage flea up or down to the human animals, that steal my pears. Sometimes I think of running away from them all, and trying my fortune at Hammondton or Vineland, but it is hard to be conquered, and compelled to flee. I love farming ; can bear with insects, birds, skunks and turkeys ; but when I see that my currant bushes have been carried off, and my cherished pear trees have been robbed of their half-grown fruit by humans, I imagine I feel something as the boy did, when he wanted to say, 'darn'em.'

"Please give me your advice, and if there is a spot in this nation where an honest man can obtain a living by honest industry on a farm, and not be robbed by loafers and other vermin, tell me where it is.

"I consider the reports of the Farmers' Club of vast importance to the agriculturist.

"In one of your reports last spring, Prof. Mapes is reported as saying that he had a carrot-weeder that weeded and combed the weeds out of carrots, and with which a boy 12 years of age and a trained mule could do as much as a hundred men in the ordinary way. Will you tell us the name of the machine, where it can be found for sale, and the price? I inquired for it at the largest agricultural warehouse in Maine, but could learn nothing of it.

Prof. Mapes said that the carrot-weeder was no myth, and its practical operation, as seen by a good many of the Club, proves it no humhug, and agricultural warehouses in New York know what it is, if they do not in Maine.

Mr. Wm. S. Carpenter.—I think the farm of Mr. Hacker must be in a bad condition and neglected. All farmers are troubled with their pests, the soil must be attended to and must be kept in good order, and have these pests destroyed, he must be a negligent farmer. As to the aphis in cabbages, they are hardly ever found upon any but stunted broken down plants.

Prof. Mapes.—There are two kinds of club foot in cauliflowers, and in the whole Brassica tribe; one is principally caused by hyridization, the other is by the use of hog-pen manure—on Bergen Hill, Communipaw, they are able to grow cabbages year after year.

Mr. John G. Bergen said that such men deserve success, and if they fail and acknowledge their failures, and tell the cause as this one has, let us inquire if there is any remedy. In his cabbage experiment he describes one of the most troublesome pests we have, and for which we have sought a remedy in vain. It is not his fault that he failed to grow cabbages, since no one can guard against these insect enemies.

The best cultivators with us do not plant the cabbage on the same soil. Sometimes they allow three or four years to elapse before they plant the cabbage again. We have some crops that can be raised year after year—for instance, onions and cucumbers.

Mr. Solon Robinson answered that the writer was not answerable for the condition of the soil, since he had not had control of it, and states distinctly that it had not been worked for a great number of years.

Prof. Mapes advised him to buy a book upon gardening, and study its rules.

Mr. Robinson said that that was the first practical advice offered this man in the conduct of his farming operations under difficulties.

Prof. Mapes said that he would tell him how the cabbage-growers about here treat the cracked heads. They watch the first sign, and start the roots about half an inch, which checks the growth and stops the cracking.

How to Feed Hogs for Pork.

Mr. A. Kendall, Darien Centre, N. Y., says: "The best method that I have attained for making pork is, to have pens ample in size, well ventilated, well lighted, kept clean, and plenty of dry straw for bedding ; and for food good sound corn, and for drink plenty of that article that everybody and everything likes—pure cool fresh water. It is very essential that we feed regularly—the same quantities at a time, and be very careful and not feed to gluttony, as it is a great waste of feed and will eventually produce disease. I feed no slops, nor swills, and am well satisfied that pork is made much quicker and cheaper without than with them, and is much more healthy."

Prof. Mapes.—An experiment was made in New Jersey a few years ago by a Mr. Mason, who proved that in feeding raw corn the pork cost thirteen cents a pound, and in feeding cooked corn meal the pork cost only four and one-quarter cents. Other experiments have proved the same facts, and farmers should make a note of them.

Plaster a Fertilizer.

Mr. Wm. Andrew, Lumberland, Sullivan county, N. Y., says that he believes why plaster is a fertilizer is owing as much to its finely disintegrated state as to anything else, and believes that any rock finely ground would be beneficial; and, in proof, instances the fertility of a stony field, where the plow is continually wearing off new particles ; and also in the fertilizing effect of road-wash, where particles are ground into impalpable powder by the horses' feet and the wagon wheels. Dust is always a good fertilizer.

Corn-Stalks as Fodder.

Mr. Willard Griffin, West Granby, Conn., says: "The butts of corn-stalks are worthless except for manure or fuel ; for, though they may contain a little nutriment, especially when cut and fermented, yet they are not worth the trouble. Cattle will eat stalks when cut, soaked, and mixed with meal ; so they would chips, if chopped fine enough. Swine will eat cob meal when mixed with that of corn, and saw-dust, mixed with a preponderant portion of fine flour, will make a palatable bread ; yet all such refuse matter, or the most of it, only goes to make manure. I think Prof. Mapes's salt and lime mixture would be a much better medium of converting such matters into manure than the stomachs of animals. Cows are sometimes induced to eat bog hay, brakes, &c., by the addition of salt or meal, when such fodder is no better for them than old shoes made into a soup would be for human beings."

"I once took a few bundles of stalks and packed them into the gangway of my cellar, where they were completely saturated with the rains and snows of winter. In the spring I threw them on to the garden, where my cow found them, and ate them all up with great eagerness. If corn is topped when the stalks are in the best condition for fodder, the corn will be much injured, so that what is gained in one way will be lost in the other. I once had an acre of stout, handsome corn ; when the ears were fully developed, and had begun to harden, and while the stalks were yet green, I topped it, and left the bottom stalks to ripen the corn. They did so as well as they could. But every kernel was shrunken and the cobs brittle. There was scarcely a sound ear of corn in the piece. Nature knows best how to ripen her fruits, and will do it if not interfered with by man's ignorance and folly."

Delaware Grape.

Mr. R. W. Holton, distributed some cuttings of the Delaware grape to the members of the Club.

Mr. Wm. S. Carpenter.—The way I propagate the Delaware grape is that I leave two eyes upon each cutting, and cut the wood within a short distance from the eyes; before you plant the cutting, cut off the hard bark. The most successful way is to raise them in hot beds.

Mr. R. H. Williams.—I have been through a number of grape districts during the past year ; and there seems to be no difficulty in getting the Delaware to grow, all you want is a little heat.

Mr. R. W. Holton.—I think that a vine should have at least three eyes, the upper eye should be at the surface, the lower eye will send out some roots, also the middle eye, the eye near the surface will also send out some strong roots; when I plant these vines I cut off the lower part about one inch below the upper eye.

Adjourned, John W. Chambers, *Secretary.*

February 9, 1864.

Mr. Nathan C. Ely in the chair.

Do the Trunks of Trees Lengthen?

Mr. Solon Robinson read this question from a soldier in the Army of the Potomac :

"Suppose an elm tree at five years has, at the height of six feet, the trunk divided into two equal branches, will the fork of that tree ever be more than six feet from the ground? In other words, does the natural body of a tree ever lengthen ?"

The opinion of all the members who expressed themselves upon this question was against the theory of the lengthening of the bole of the tree.

Mr. E. Williams said the height of the fork would be increased only by the layers of wood.

Mr. A. S. Fuller, said in all his observations of trees he had never witnessed any increase of length.

Dr. Grant said it was a fact worthy of note that a limb growing horizontally from the bole will appear in time to be lower, because the growth is most rapid from the lower side. For all practical purposes of growth, the center of a tree or large limb is dead ; and, if bored away, would not affect the exterior growth of the tree.

Mr. Solon Robinson said this fact was exhibited most markedly in the sycamore tree. He has often seen it growing apparently perfectly healthy, though nothing but a shell of less than two inches thickness.

Mr. R. H. Williams inquired whether a notch cut in the bole of a tree will not in time be found higher from the ground than at first.

Mr. A. S. Fuller answered : Never. If there is any change, it will be apparently downward, but this will be owing to the accumulation of earth, as a tree never changes in length.

The only evidence adduced to the contrary of these opinions was by Dr. Trimble, who said that Rip Van Winkle, when he commenced his twenty years' nap, hung his powder horn upon the limb of a tree, which he found, on awakening, had been carried by the growth of the tree far beyond his reach.

APPLES.

Dr. Trimble presented some fine specimens of the Westfield Seek-no-Further, and Mr. Wm. S. Carpenter some Swaar apples, which varieties were tested and pronounced very superior apples.

Dr. Trimble asked if there were any better apple than the Westfield Seek-no-Further.

Dr. Grant and Mr. Carpenter said it is not to be compared with the Northern Spy.

Mr. Fuller said : No, nor with the Swaar. It has been alleged that Mr. Prince, sen., named this apple. Is it so?

Dr. Grant said : No, it dates back to a much older period.

GRASSES.

Mr. A. W. Hillman, Sharptown, Salem county, N. J., inquires about the three following grasses : The Iverson, the Randle, and the Ray.

Mr. Solon Robinson.—The Ray is the perennial Rye grass, *Lolium perenne.* It is very generally cultivated in England, but has not found favor in this country because other grasses are considered more nutritious. The other two, we believe, have never been tried in this country.

Mr. John G. Bergen.—What is the botanical name of our common grasses?

Mr. Wm. R. Prince.—This question can only be answered by stating that there are two very distinct species so termed.

The commom Lawn Grass or Spear Grass, is the *Poa annua* of Torry and Gray, a native of Europe and described in ancient English botany very fully and also by Linnæus. It is an annual plant and seeds very freely, this insures a continuation of young plants which cover the soil.

The common grass of our fields and pastures is the *Poa pratensis*, a perennial species, a native of northern and middle Europe. Its usual name is meadow grass and it is described by Torry and Gray and other botanists, It ofttimes is found on our lawns mixed with *Poa annua*, and being perennial it will sometimes usurp the place of that annual species.

Blue Grass or *Poa compressa* is a perennial and creeps vigorously. It is extensively cultivated in some regions of our country and held in high estimation in the Western states and elsewere.

DIOSCOREA BATATAS.

Mr. Solon Robinson.—Mr. Hillman also wants to know what has become of the Dioscorea Batatas which made such a great noise a while ago, and of which it was said it would produce sixty tons to the acre. "I suppose," he writes, "such a vegetable must have found its way to the New York market by this time. I should like to know its wholesale price; what have been the profits of its cultivation, and how near any have come to raising sixty tons per acre." This enquiry about an exploded humbug produced no little merriment.

Mr. Fuller said he had found no difficulty in growing a large quantity per acre, but no one could afford to grow it as a crop, as it cost more to dig the roots than they are worth in this market. I think the flavor of this potatoe is equal to the Irish variety.

Mr. Wm. S. Carpenter.—I do not agree with the last speaker; I do not consider it equal to the Irish potato. I tried it in my family, but they did not relish it, and did not care to taste them again.

POTATOES.

Mr. William Edmonds, of Newark, N. J., wants to know if any of the Club "have tried Goodrich's seedling potatoes—enough to form an opinion as to their merits? The Mercer has got to be so notoriously unproductive and uncertain, it becomes us to try some other to take its place."

Mr. William S. Carpenter.—A great many persons beside members of this Club think that Mr. Goodrich has conferred a great benefit upon the country by producing several varieties of potatoes of great excellence. The Garnet Chili is very good, but the Cusco White is probably better and more profitable, producing three hundred bushels per acre, or twice as many as can be grown upon the same soil of Peachblows. The Pink-eye Rustycoat was another excellent sort. The Copper Mine is very valuable wherever it is desirable to have a crop ripening late. All these new sorts have improved, year by year, and are still improving in quality.

Mr. Williams, of New Jersey, said he had had two years' experience with these potatoes, and considered the Copper Mine the best, though most liable to rot. The Rustycoat is coarse and rank, early in the season, but is a very good potato at this time. Of the yield of these new sorts of potatoes, compared with the old varieties, Mr. Williams gives the following tabular statements of his experiments in 1862:

	Primes.	Culls.	Rate per acre.
2 rows P. Alberts yield........	1 bu. 18 qts.	9 qts.	88 bu. 6 qts.
2 rows Jersey Mercers yield...	1 bu. 22 qts.	7 qts.	91 bu. 18 qts.
2 rows Nova Scotia Mercers...	2 bu. 23 qts.	22 qts.	163 bu. 20 qts.
2 rows Peachblows yield........	1 bu. 22 qts.	22 qts.	114 bu. 3 qts.
2 rows Garnet Chili yield.....	2 bu. 10 qts.	6 qts.	120 bu. 3 qts.
2 rows Copper Mine yield.....	3 bu. 24 qts.	13 qts.	199 bu. 21 qts.
2 rows Pink-eye Rustycoat....	3 bu. 16 qts.	32 qts.	216 bu. 6 qts.
2 rows Cusco White...........	4 bu. 16 qts.	16 qts.	240 bu. 7 qts.

The grand product was measured accurately, the sorts treated alike, and the rows contiguous to each other.

Mr. Williams also gives the following results of experiments with different sized seed in 1860:

	Primes.	Culls.
1st row, small seed, cut in 2 to 4 pieces, yield	16 qts.	19 qts.
2d row, small seed, whole	16 qts.	23 qts.
3d row, large seed, cut to 2 and 3 eyes	19 qts.	13 qts.
4th row, large seed, cut into small ends	13 qts.	17 qts.
5th row, large seed, cut into stem or butt ends	16 qts.	18 qts.

It will be seen from the above that the small ends of large seed gave the least yield, and small seed, whole, the largest yield, the excess being in small potatoes, while the large seed, cut, gave the least small ones and most large ones.

POUDRETTE.

Mr. R. G. Pardee inquired about the use of poudrette as a fertilizer, and its value. He understands that the material of which it is made is so abundant that vessels are loaded and taken down the Bay and the contents discharged into the ocean. Can we afford to lose so valuable a substance?

Mr. W. S. Carpenter said that however valuable poudrette may be for some purposes, it had proved of detriment to farmers who relied upon it to produce a crop. Some in his neighborhood who applied it in the hill when planting corn, obtained an early, rapid growth, but when the time came for setting ears, the strength of the manure being exhausted, the crop was hardly worth harvesting.

Mr. E. Williams said he had used it for many purposes, with decided advantage. It is an excellent manure, and is used extensively both in corn and potatoes. Any farmer can make it; it is only deodorized human excrement, which can be done by the use of charcoal, coal ashes, soil from the headlands, &c.

Mr. W. S. Carpenter thought that as to the corn crop, if a farmer spent the money for ashes instead of poudrette, the results would be far more satisfactory.

WORKING OXEN IN HARNESS.

Mr. R. G. Bolles, Le Raysville, Ind., says: "I am a young farmer, and have given much attention to breaking young oxen, and wish information whether oxen are successfully worked in harness in any part of our country; if so, where, and what is the construction of harness, &c.?"

Mr. Geo. Bartlett said that the shakers in the neighborhood of Pittsfield, Mass., formerly used a great many oxen harnessed with leather breeching attached to a wooden yoke, not unlike the part of an ordinary ox-yoke which encircles the neck of one ox.

Mr. R. H. Williams, said he had frequently seen oxen harnessed with the harness and collar like a horse.

ADIRONDAC GRAPE.

Mr. A. S. Fuller stated that he had visited the orginal vine which he found growing on the west bank of Lake Champlain, fifty or sixty miles south of Plattsburg. He found it in the garden in company with several Isabella and other sorts, including the Sweet Water, all of which were ripe at the same time, which was the last of September. The situation is about twenty or thirty feet above the level of the water, surrounding on all sides but the south, by a hill perhaps one hundred feet high. The soil is decomposed rock, in which vines grow luxuriantly; and owing to the peculiarly sheltered situation, the fruit ripens as early as it would two or three degrees further south. The vine shows very slight difference, if any, from the Isabella. I do consider it a good grape, though not a great acquisition until it is proved that it will ripen well in all situations. I never said or wrote that I thought it a great acquisition, though I have seen it stated in print that I did say so. We have yet no evidence that the Adirondac will ripen earlier or be any better here than the Isabella. My young vine, for which I paid five dollars, has not made any remarkable growth this year, and shows nothing different from the Isabella. As to quality, although the Adirondac is considered a good table grape, in my opinion it does not come within gunshot of the Delaware. It is a good table grape because it is mild, and not sour; it has no other marked character.

Mr. Carpenter said he should be very much disappointed if the Adirondac does not take a very high stand, since it has been almost universally pronounced excellent by those who have tried it.

Mr. A. S. Fuller thought we ought to be very careful how we puff any sort until we are able to speak of it as we can of the Delaware, and say, I know it is good. I have heard a great many worthless grapes puffed before now. There is Underhill's Saratoga Seedling, a poor, worthless sort, sent out with a picture of a bunch of Dianas, to make it sell under false representations. Where is the much-puffed Rebecca? It may grow here and there in the garden; it is good for nothing in the field. The To Kalon, which was sold at five dollars a vine, has gone to the shades; ditto of the Logan. I have bought at high prices and tried all the new sorts, but begin to think it time to stop. I am willing to encourage all new varieties, but do not think it necessary to invest any man with a crown because he has succeeded in producing a new grape, which may be good in his own garden, and nowhere else.

The Subsoil Plow for Corn.

Mr. Benton Aldrich writes from Waneka, Dunn Co., Wis.: "You said, if I remember correctly, that you subsoiled between the rows after the corn was a foot high. What size of plow did you use for that? I wish to add a word of testimony to the value of the Reports of the Club. My neighbors' corn was very much injured by the July frosts, 13th, while mine escaped through superior cultivation, the knowledge of which I obtain from your Club reports."

Mr. Solon Robinson answers, the smallest size of Mape's Subsoil Lifter. It is wrought iron and steel, costs about seven dollars, and is easily operated by one horse. What he says in regard to the escape of his corn from frost, has been proved in many other cases. Crops grown upon well drained land, upon deeply plowed land, or when the crop had received superior cultivation escaped injury from frost, while adjoining fields were destroyed.

Turpentine from Northern Pine.

Mr. A. Woolston, Lisbon, N. H., wants to know, "if spirits of turpentine can be manufactured to advantage from our common sapling pines, such as grow here in New England? And if so, can you give me the necessary information concerning the process of manufacture to enable me to make an experiment."

Mr. Solon Robinson—Spirits of Turpentine can be made from any tree which yields pitch in sufficient quantity to pay for gathering. The only question is, whether the price will warrant the undertaking in New Hampshire, where the trees yield pitch so scantily, compared with the yield of southern pine. The southern mode of collecting it is by cutting a box in the bole of the tree near the earth, which will hold from a pint to a quart of the liquid. During the season the bark above this cavity is gradually cut away, which causes a new flow of the pitch, that trickles to the box, which is emptied, when full, by dipping it out with a little paddle into buckets. This process of barking is continued as high as a man can conveniently reach. Next year the tree is boxed on the other side, and the process repeated, leaving just sufficient bark to continue life in the tree during that season. Of course, in time, this works a total destruction of the forest.

To Prevent Bark Blight on Apple-Trees.

A correspondent in Illinois recommends nailing or tying a piece of board three or four feet long to the boles of young apple-trees upon the south side, to protect the trees from the effect of very warm days in winter, which he thinks the cause of the bark blight. He also recommends great care in the selection of scions for grafting from sound, healthy limbs. Those grown upon the outside near the top of the tree, are generally the best. He thinks it would be a good plan to put marks upon limbs while in bearing, which produce the soundest, handsomest fruit, from which afterward to cut scions for grafting. He also recommends the propagation of gooseberries from the top limbs instead of young suckers.

Adjourned. John W. Chambers, *Secretary.*

February 16, 1864.

Mr. Nathan C. Ely in the chair.

Grape Cuttings as a Fertilizer.

The Chairman asked what is the value of grape cuttings as a fertilizer for the vineyard, and how should they be utilized? He stated that he was induced to make this inquiry because he had lately seen a nurseryman of Norwalk, Conn., throwing away a large quantity of this material, and he wanted to know whether he could afford to do so. Mr. Ely said that he was so impressed that it was valuable as a fertilizer, that he had ordered his farmer to haul it home. The question now is, what is the best mode of using it?

Mr. R. W. Holton, a vine culturist of this vicinity, said that it was his practice formerly to chop up and bury all of the cuttings; now he burnt and uses the ashes, and thinks in that way to get all the essential ingredients of the vines.

Mr. Adrian Bergen said he was opposed to burning anything upon the farm. He gathers all the weeds, twigs, &c., and composts them with manure until they decay.

Mr. Wm. S. Carpenter stated that it was the practice of Thomas Hogg, a nurseryman of this city, for many years to save the pruning of all kinds, and all the coarse weeds and refuse about the place, and he piled the wood with alternate layers of sods, and burned the pile, and used the ashes. I pursue the same course. It is the opinion of Prof. Mapes that this substance is of great advantage. It is even questionable whether it would not be worth while to burn chip manure.

The Chairman.—Are the ashes of vines, whether decomposed by burning or otherwise, better manure for vines than any other material?

Mr. Carpenter said: Yes, undoubtedly, unless you take too much time in their preparation.

Dr. Trimble said: We know that in Europe vine-dressers are careful to save all their cuttings to apply to the vineyard. Perhaps that is because they cannot get other fertilizers. I know one man who obtained the refuse of a large railroad wood-pile, which he applied to a pear orchard upon the sandy soil of New Jersey with very great benefit.

Mr. R. H. Williams said that he could not regard any peculiar property that attached to the grape-vine as such at all essential to its manurial qualities. But if burned to ash, the value consisted in its potash, which might be more or less than some other kind of wood and proportionately valuable. If composted, its value consisted in the amount of ammonia and alkaline matter evolved by the process.

Mr. Solon Robinson.—I see among us to-day Col. Haraszthy, of California, the well-known vine-grower and wine manufacturer. I hope the Colonel will give us some information on this important subject.

Grape Culture and Manufacture of Wine.

Col. Haraszthy said that he did not know what he could say that would be interesting to those present, but was willing to answer any questions that might be put to him. In reply to this offer, he was plied pretty freely for the next hour, and answered in substance as follows: That he was extensively acquainted with the practice of European vine-dressers, particularly in his native country, Hungary, and in Germany, and that it was the general practice to carefully save all the cuttings of the vine. Some dressers compost them with cow and horse manure until they decay, but most generally they are burned, and the ashes carefully used upon the vineyard. The owners of vineyards prefer them to all other manures, as strong manure often injures the qualities of the grapes. In and around villages the cuttings are carefully saved and tied up in bundles, and sold to bakers or distillers, with especial reservation of the ashes. A man sold his vines to a baker, reserving a certain number of barrels of ashes, and the baker sold the vines to another person, and gave to the vine-dresser common wood ashes, upon which he sued and recovered damages for the difference in value between the ashes of the vine and of other wood. Some vineyards that have not been ashed appear to have become destitute of potash, and require ashes to renovate the vines. Lime is also used. Guano was thoroughly tried at Weisbaden, and proved of no value whatever. A good many of the vine-dressers prefer to mix the ashes with a compost of manure instead of applying them separate. Some of the old vineyards in Germany appear to be so exhausted as to require manure ; but ashes, whenever they can be procured, are always preferred. Col. H. said that he had procured from Europe what purported to be about 1,400 varieties of grapes, but really there are but a little over 300 distinct sorts. He has tested 73 varieties, until he is satisfied that they do as well as in their native country.

As there is a good deal of variation in the soil upon the Buena Vista estate, he has endeavored to plant each sort in soil as much as possible like that where they flourish best in Europe. He has tried several varieties of native American grapes, such as Isabella, Catawba, Delaware, Scuppernong, and others, and find them all inferior in California soil to the imported varieties. He has proved that the old Mission grape of California is the same as one recently imported from Andalusia. This proves that no change has taken place in European grapes, imported, probably, about the year 1725, though since that time they have progressed northward several degrees along the Pacific coast. Of recent importations, the first one was made from France in the year 1846. The vines were planted near Ros Angelos, in flat, sandy soil, where they did not do well. The third year after they were planted the land was irrigated, the vines made abundance of wood, but very little fruit, and the attempt was abandoned. In 1850 Mr. Delmas and I imported a great many, which we propagated successfully. I know of no country in the world possessing as many advantages for the vine-grower as California. I have fully proved that vineyards can be grown by deep cultivation without irrigation. We have good soil on all the hillsides; we have no hail, rain, nor frost to injure the fruit; we are not troubled with the rot, and our vines produce as much as in the south of Spain. We can make 2,000 gallons of wine to the acre. I have one vineyard, the vines thirty-two years old, which averaged last year eighty pounds to the vine. Six-year old vines should average ten pounds, at eight years fifteen pounds. Our vines bear at three years old. We plant our vineyards eight feet apart, and cultivate them with what may be termed a shovel gang-plow, which runs six inches deep. We plow each way eight times, in January, February and March. Some years ago I supposed it necessary that all vines should be grown upon stakes, after the European method. I have since learned that it is not necessary to incur that expense in California. I prune my vines in winter upon the spur system, leaving three to six spurs, according to the size of the vine. I never summer-prune; and after June there is no plowing, and the vines are permitted to run and tangle with all the freedom of a bean or pumpkin field. Much of the fruit sets within six inches of the ground, and, indeed, when ripe, many of the bunches rest upon the earth, and, as we have no rain to injure them, the grapes are thought to be better than when grown at a considerable elevation. When the pruners get to work they throw the cuttings in small bunches between the rows, which are pitched upon a sled passing along the rows already cleared and hauled out into the broad alley, where they are burned, and the ashes carefully saved as a dressing for the vineyard. It is still a mooted question whether it is best to plant a vineyard eight feet by eight and grow fifteen pounds upon each vine, or to plant two and a-half by three feet, producing less to the vine but the same quantity to the acre. I once held that it would make no difference whether we make fifteen pounds from one or six vines. In my late tour in Europe I have been led to doubt upon this question. Many hold that the six vines tend more to draw all the strength of the soil, that the grapes will be better, the yield more certain, and that they will make better wine. I would, however, recommend, whatever the distance apart, that the vines should always be planted in squares, so that they can be cultivated by the plow both ways. We are very little troubled in California with any disease of the vine. They find some mildew in low situations, but none was spoken of by the *padres* who left records at all the Missions touching the growth of the vine in California.

We sometimes have a small white fly, not larger than a pin's head, which slimes the leaf, causes it to turn yellow and sometimes to drop off. This does not appear to check the growth of the vines nor injure the fruit. I once practiced jarring the vines, which dislodges the fly, and by working the earth destroyed them. I continued this ten or twelve days, but saw no material benefit to the vines thus treated, and last year saw very few of the insects. We successfully grow the same grape in California that makes the Burgundy wine of France. Champagne is made from the old California vine, and also from those imported, and no one can tell the difference between Champagne made in California and Champagne made in France. We grow the Kisling, from which the famous Johannisberg is made, and it is possible that localities will yet be discovered that will produce a wine equal in every respect to that celebrated sort. The Noria and Pinio planted in grey soil make wine like the Burgundy. The quality of the soil makes a vast difference in the quality of the wine. We never add sugar to the must, because our soil and climate produce sufficient in the fruit. In countries where that is not the case, sugar should be added. Potato or starch, sugar or highly refined cane sugar, only should be used. When there is too little tartaric acid more should be added; if in excess, it must be taken away, as wine requires exact proportions of these two ingredients. To make wine of first quality, no sugar nor water should be added to the must.

At Buena Vista, we distil all the second class wine, and the brandy has such reputation that it sells readily at $5 per gallon. There is connected with this estate about 6,000 acres of land, owned by a joint stock company who now have 900 acres in vines, and intend to plant 3,500 acres. When I planted the first 40 acres where it would not be possible to irrigate the vineyard, I was told that it was impossible to grow vines in such a situation. When it was discovered that they grew vigorously, I was told that it was impossible to produce fruit without irrigation. The third year I had a considerable crop, and land in that vicinity, hitherto worthless, directly attained a salable value. We now have a three-story building for the wine-press, operated by a steam engine, which is supposed to be the only one in the world similarly employed. The fruit is brought to the upper story of the wine-press in wagons, each of which carries forty boxes, so that the exact quantity in each load is known. The juice that runs from the mill, and from the mass before pressing, makes first class wine. The mashed grapes fall from the mill into vats, which will contain 35,000 lbs., and this is digested with clear water fifteen days, when it is drawn off for second quality wine which is distilled for brandy. The first run of juice is conveyed into tanks, which hold 500 gallons each, where it stands about six hours, not to ferment, but to settle all dirt, when it is drawn off into a vat that holds about 4,000 gallons, and in the mean time the small tanks are washed, ready for a new charge. From the large vat, after proper fermentation, the must is pumped up about 100 feet into a reservoir, immediately over the wine-vaults, which are extensive excavations into the solid rock of the hillside. From this reservoir it is conducted by pipes to the wine-vaults, where the casks are filled by means of a gutta percha hose. It is estimated that there are now in the valley of Sonoma about 2,500 acres in vines, and 14,000 acres in the State, and there are now growing in the State 25,000,000 of vines; and as the number is constantly and rapidly increasing, it will not be difficult for any one here to calculate that the time is near at hand when San Francisco will be fully able to furnish all the States in the Union with wine at a price so low that it will nearly stop its importation from Europe. Beside grapes for wine, we have sold large quantities in California fresh at 25c. per pound, and also made raisins from the Malaga grapes, esteemed fully equal to those imported. Beside grapes we have grown considerable crops of almonds and olives; peaches, too, are grown to such an extent, that they sold last season in San Francisco at 20c. per basket. It is estimated that there are 4,000,000 of bearing peach trees in the State. The fruit is very large and beautiful, but not so high-flavored and delicious to the taste as those grown in this vicinity. The old Mission peach is a small good variety, and it appears that only one sort was ever cultivated, as they are found alike at all the Missions. The trees are very large, in size resembling the apple-tree. The only disease appears to be the leaf-curl.

Almonds are entirely hardy, the hard-shell variety rather the most so. This fruit will grow wherever peaches will, but should never be grafted on peach trees, nor should the soft-shell variety be grafted upon the hard. I planted 8,000 peach trees and 6,000 almonds in 1852, which have been allowed to grow pretty much as they please, and have attained a great size, and are still healthy and productive. The apricot succeeds well on the flat land, but not upon our hills.

In answer to the question whether the curl affected the native peach tree, Col. H. said, yes ; more than those which have been introduced from the Eastern States.

On motion of Mr. Carpenter, the thanks of the Club were tendered to Col. Haraszthy for his interesting remarks.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

February 23, 1864.

Mr. Nathan C. Ely in the chair.

Manufacture of Wine.

Col. Haraszthy said it is, of course, impossible to ship pure grape juice here in an unfermented state, because fermentation begins immediately after the grapes are mashed, particularly in a hot day. The technical name for the juice is must. It is not called wine until after it has fermented, and fermentation produces spirit, which gives it strength to bear transportation. Some wine contains so small a percentage of spirit that it does not bear transportation. Some very light wines that will not bear transportation in casks will bear it in bottles. We cannot safely ship our California wines at less than one year old. If shipped before it is ripe it would be likely to ferment, and perhaps change to vinegar, in passing the tropics. If in good order for transportation when shipped, it would improve on the voyage. If must is too long exposed to the air, it is injured, because there is a tendency to active fermentation, and that tendency must be guarded against in all subsequent stages. When finally transferred to the casks in the even temperature of the wine-vaults, to perfect its fermentation, the air must be carefully excluded. This is done by inserting a siphon in the bung-hole, with the other end in water. The gas produced by the fermentation passes over and bubbles up through the water, which excludes the atmosphere. When no bubbles are perceptible, the siphon may be removed and the cask closed. The wine still continues to ripen and improve by age. This matter is fully treated in the volume I published about wine-making.

As to the question whether the first run of juice, that is, the wine obtained without pressure, is the best, that is a mooted question in Europe. In the districts where the Chamberlain wines are made, it is the general opinion that the best plan is to press the grapes and mix all the must together; that which runs out or is pressed out.

Wine Interests of California.

Mr. W. S. Carpenter asked Col. Haraszthy in relation to the wine interests of California.

Col. Haraszthy, in answer to this question: I beg leave to offer an article in the San Francisco Mercantile Gazette, which shows the rapid increase of wine culture.

"In the year 1856 the grand total of vines in this State was 1,540,134; in 1857 it was 2,265,062; in 1858, 4,054,548; in 1859, 10,000,000; in 1860, 14,600,000; in 1861, 17,500,000; in 1862, 20,000,000. The bearing vines in 1862 produced about 146,000,000 pounds of grapes; from these grapes about 8,000,000 gallons of wine, 500,000 gallons of brandy, and 300,000 gallons of vinegar were made, while a large amount has been consumed as grapes.

"The crop of 1863 (estimated), 12,000,000 gallons of wine, 800,000 gallons of brandy, and 500,000 gallons of vinegar, leaving about 40,000,000 pounds of grapes for consumption.

"The above enumerated vines will occupy an area of about 25,000 acres.

(In the southern part of our State they plant 1,000 vines to the acre; at the north, 680; here usually an average of 500 vines to the acre.) The cost of planting and cultivating until in full bearing (which is four years) can be estimated, including the price of the land, on an average $200 per acre; this will show a capital invested of $5,000,000. Now to show the real value of the vineyards of our State we have to ascertain their returns on wine, brandy, vinegar and grapes sold as such for consumption; and we give here their valuation at reduced prices, viz:

40,000,000 lb. of grapes for consumption, 1½ cents on an average, would give	$600,000
12,000,000 gals. wine, averaging 30c per gal	3,600,000
800,000 gals. brandy, averaging $1 per gal	800,000
500,000 gals. vinegar, averaging 10c per gal	50,000
Total	$5,050,000

EXPENDITURES.

Cultivating 25,000 acres land at $20 per acre	$500,000	
Picking the grapes and making the wine at 2½c per gal.	300,000	
Barrels for 2,000,000 gals. at 5 cents per gal	600,000	
Barrels for 800,000 gals. brandy at 6 cents	48,000	
Making the brandy at 10 cents per gal	80,000	
Barrels for 500,000 gals. vinegar at 4 cents	20,000	
Interest for the stock capital of $5,000,000 at 18 per cent	900,000	
Interest of $900,000 invested on buildings, cellar, etc.	180,000	
		$2,628,000
Leaving a clear profit of		$2,422,000

"Now, if $18 a year, at the current rate of interest in this State, represents a capital of $100, the above income of $2,422,000 represents a stock capital of $13,444,250; or each acre, which cost, with all the improvements thereon, but $200, is now worth $437.77. The estimates for working the vineyards are calculated upon the very highest wages, $45 per month with board; so, also, the prices of the barrels are stated at very high rates."

It is estimated that the State of California has 997,760 acres peculiarly adapted to the culture of the grape, which would yield a yearly average of 598,656,000 gallons, which, at only 25 cents per gallon, would amount to $149,664,000, or more than the entire cotton crop of the South. Speaking of the population that a wine producing country may sustain, the writer says:

"The number of persons who, as owners, laborers, or members of the families of laborers, may derive support from the grape culture, must, at a low estimate, be sufficient to average three individuals per acre—giving a total of nearly three millions, who might easily find sustenance by this one branch of industry in California, while the number of persons partially sustained and benefited by such an extensive culture of the vine, would amount to three times this number. In some of the mountain districts of Europe, where no other occupation of comparative importance is pursued, a numerous population, not directly engaged in vine culture, derive their support from this source. The small, rocky island of Malta contains proportionally, the greatest number of inhabitants in the civilized world—1,400 to a square mile—yet this dense population, with no other important resource, earn a livelihood mainly from the products of the vine, although the cultivators are obliged to cover every bare rock with soil, which they carry on their backs to places inaccessible to vehicles, in order that no spot on which a vine can grow may be allowed to lie in waste."

Col. H. answered several questions about growing almonds—that the trees are as hardy as peaches, though a little more liable to injury from frost in spring, as they blossom two weeks earlier. The growth is rapid, say five feet the first year from the bud. At three years old, the produce is five to fifteen pounds of fruit per tree. When he grew them in Wisconsin, he used sometimes to throw water on the trees early in the morning, when there was danger of injury from the frost of the previous night.

Altogether, the statements of Col. H. gave great satisfaction to those present, and he had to beg to be excused from occupying all the time. He wished the Club to proceed with other business.

West Jersey Soil.

Mr. Jacob Hugg, Jacobstown, Burlington, N. J.—For some time past I have read with considerable interest the doings and suggestions of your Club. Whatever is of interest in the noble work of tilling the soil, growing fruit, raising and improving stock, in a word, developing the resources of our great and glorious country, deeply interests me. Though not now a farmer, yet I get many valuable hints from your conversations and from the inquiries of your correspondents, which I communicate to my neighbors and friends who are so engaged.

I was surprised at the remarks of Mr. Judd at the Fruit Growers' Association in reference to the southern portion of the State of New Jersey, in which he says such loamy situations were rare, that the sand was undulating, and crops out very often, or lies so near the surface as to make the land barren, &c.

Now, that there are many sand fields scattered about over Southern and West Jersey, no one will deny, and that there is sand in the vicinity of Hammondtown, and indeed all over, or nearly all over South Jersey, all will admit, but to say that "the sand lies so near the surface as to make the land barren," is at variance with facts which would astonish Mr. Judd. Nor is his other remark nearer stating the truth, viz: "Such loamy situations were rare."

Now, the facts are these: In many parts of South Jersey, what were considered worthless, worn out sand farms years ago, are now found to be productive and very profitable. The reasons are simply these—*under-draining, deep ploughing, marling and liming.* Farms that could have been bought for from ten to twenty dollars per acre, fifteen or twenty years ago, can not now be bought for less than one hundred dollars per acre. And what was considered pine barrens and scrub-oak lands (the more of which a man owned the worse he was off), are now selling at from twenty to fifty dollars per acre, and when once cleared, which is not very hard to do, and seeded down in clover, it readily brings from fifty to one hundred dollars per acre.

Instead of "loamy situations being rare," it has been found that there is a bed of loam under the whole, or nearly the whole of South Jersey.

Some of the finest turnpikes in the United States, may be found in South Jersey, and the material for making them is found under the sand by the road side.

The sand surface which gives much of this portion of the State a worthless appearance to the traveler, or casual observer, is really of great value to the farmer when ploughed under and mixed with the loam. It is easily vitalized by the many fertilizers of the day. It makes the work of farming comparatively easy; it holds moisture better than any other kind of soil. The whole country is well adapted to all kinds of fruit, grasses and grain. Perhaps the Club will smile when I tell them that I have seen corn stalks grow in this white sand, in Cape May county, with a moderate top dressing of stable manure, to the height of 13 feet, and the yield per acre from 40 to 80 bushels of corn. The enterprising people of this and other States are finding certain facts very rapidly, down here in Jersey.

1*st Fact*—The soil is much better than has heretofore been represented and they expected.

2*d Fact*—It is well adapted to all kinds of fruits, grains, grasses, and potatoes.

3*d Fact*—There is plenty of marl and peat, and that these make the land rich and productive.

4*th Fact*—What was considered unreclaimable land—such as vast greenbriar swamps, can now be under-drained and made to yield crops equal to any that can be produced in any of the States.

5*th Fact*—That the finest cranberry fields or bogs can be made in South Jersey of any other in the Union.

6*th Fact*—The climate is soft and genial as any could well desire.

7*th Fact*—That this portion of the State is being cut by railroads to many important points.

8*th Fact*—That the people who made their living by burning charcoal and lumbering have found out, of late years, that the wealth is in the soil.

9*th Fact*—The wilderness is beginning to blossom as the rose, and the solitary place is filled with rejoicing.

When to Cut Timber.

Mr. S. P. Dow writes from Newmarket, N. H., and gives abundant evidence in favor of cutting forest trees, whether for fuel or timber, the last of August or first of September. He says that Governor Plummer, from twenty years' experience, gave it as his opinion, that fuel cut at that season would last twice as long, and give more heat all the time. Fuel may be cut in all the autumn months, but never should be from January to June.

A New Farmers' Club

Has been organized at Westbury, L. I., and a letter from Isaac H. Cocks informs us that at the first meeting several of the members were surprised to learn what was the food of crows in winter.

The Food of Crows in Winter.

He says that John D. Hicks, Westbury, L. I., lately shot a crow and examined its craw, and found nine-tenths of its contents were grasshoppers, thus showing that the much-despised crow is truly a friend to the farmer, destroying the grasshopper, while in a dormant state; so we can afford to feed him when snow covers the ground.

This elicited considerable talk, all friendly to the crow, as a valuable aid to the farmer.

Dr. Trimble said that he had proved that crows will not pull up corn, if the owner will soak corn and sow it about the field. I examined the contents of the crows' stomachs, and found it to contain grasshoppers and beetles. These are found near the roots of the grass.

Mr. Thos. Cavenach.—It is not often we see crows on the fields near where I live; but during the winter this year I have seen larger quantities on the fields picking something from the grass.

Mr. Carpenter said it was hardly necessary to soak it. You may sow it dry.

Hornless Spanish Bucks.

Mr. T. H. Pettis, Tappan, Harrison county, Ohio, answers the inquiry upon this subject, that he has a full-booded Spanish buck without horns, which he considers a valuable improvement.

Pickles.

Mr. H. A. Sheldon, Middlebury, Vt., says, after trying numerous plans, he has adopted the following as the best way to pickle cucumbers: "Put them in very strong brine forty-eight hours, and from that direct into cider vinegar, adding spice and pepper to suit. They are good in three weeks and keep two years, sound and crisp."

A Miscellaneous Letter.

Mr. S. S. Gregory writes the following letter from Berea, Ohio. It contains some valuable information. He says:

"Being of the opinion that much valuable information to the agricultural community has been spread by the American Institute Farmers' Club, and believing that a fair share of that information has been contained in 'letters from the people,' it helps to induce me to make one effort to contribute a mite to swell the amount of such knowledge. If farmers in general, who have valuable facts in their possession, would give, briefly and explicitly, such facts to the public, it would, in my estimation, greatly conduce to the advancement of agricultural science. And in order to be perfectly understood as to what is meant by these remarks, I will give as good a sample as I am able to give of what is intended:

SALT AS A MANURE.

"Salt, there is no reason to doubt, is valuable as a manure; but to show that it may easily be used in improper quantities, I will state a fact that came under my observation. From a cause, not necessary to mention, some brine got down among the roots of a cherry tree; the consequence was that the cherries were salt and shrivelled—in fact, quite spoiled for eating, and the leaves of the tree presented a yellow sickly aspect.

BENEFIT OF ASHES UPON PEACH TREES.

"Within the last six years a leach tub or barrel stood as much as two years over the roots of a peach tree, now about twenty-two years old. For at least twelve months of the time some of the lye from the ashes in the barrel, and lye from the partially leached ashes thrown from the barrel, had an opportunity, when it rained, to get down among the roots of the tree. And that tree, with its old top broken off about six feet from the ground, now has a new and thrifty top upon it. Out of about fifteen trees set out at the same time as this one, there is none that presents as vigorous an appearance. Most of the others are either dead or nearly dead.

CUT POTATOES—HOW THEY SHOULD BE PLANTED.

Two rows, each about eight rods long, were planted in drills with 'long red' potatoes, cut endwise through the middle. The first hill was planted with the skin side up, the next with the flesh or flat side up, and the next like the first, and so on to the end. The result was that those planted with the eyes or round side up, yielded about one-fifth more than the ones planted with the eyes downward.

GREAT YIELD OF STRAWBERRIES.

On a piece of ground, shaded about half the day by a tree and a building, there stood, in 1862, a row of the Albany or Wilson strawberries. This row stood between other rows, and near twenty inches from them the ground on which they stood had become rich from a variety of causes; among which may be enumerated rotten potatoes, rotten apples and peaches, and fine straw and hay blown from a barnyard near by. The season 1862 in this vicinity was a remarkably good one for strawberries, as the rains came at very favorable times. The fruit from about five feet of this row was measured, and the yield was at the rate of 720 bushels, dry measure, to the acre. In making the estimate I measured half way to the adjacent rows, and half way to the next plants in the same row. This crop was from plants set out the year before; and in 1863 there were very few of the plants alive.

GRAPE VINES INJURED BY WINTER COVERING.

This vicinity—near the south shore of Lake Erie—is considered favorable for raising grapes. I have about sixteen vines of the Isabella kind. Last winter three of these vine were placed upon the ground and covered with straw. Result: the vines covered did not bear the past season one-quarter as much as my other vines. It is, perhaps, well to mention, that in general it does not freeze as hard in this vicinity as it does in several other places in the same latitude.

SOIL INJURED BY BURNING.

There are probably very few kinds of manure as favorable to fruit, &c., as the dark colored vegetable mold, generally existing on lands recently cleared. And the reason of calling attention to this fact is the belief I have long entertained that a vast amount of valuable food for vegetables has been lost by burning too closely when preparing land for the first crop.

Some people appear to think that if it is very dry, so that a clean burn can be had, it is all the better. Probably millions of dollars worth of the very best kinds of vegetable substances have been reduced to ashes by burning over land when too dry. It is true ashes are valuable as manure, and it is also true that some lands are made better by severe burning; but in many cases where land has been cleared the ashes are not near so valuable as the rich mold would have been had it not been reduced to ashes.

WHAT WOULD CONDUCE TO FARMER'S HEALTH.

Anything conducive to the health of horses, cattle, sheep, &c., would be considered legitimate subjects for discussion among farmers' clubs; and as I cannot see why it is not fully as important that the farmer, who takes care of the horses, cattle, &c., should have his health attended to, I will briefly remark, first, that after several years consideration of the subject, during which I have had considerable experience bearing thereon, I have come to the conclusion that if farmers were to invariably have large open fireplaces in their houses, instead of stoves, to warm by, much bad health would be prevented. Second, that if farmers' wives would, as far as they can consistently, prepare no food and drinks but such as are known to be healthy, there would be considerable ill health avoided, and consequently the good things a kind Providence has sent us would be better welcomed and enjoyed than in some cases they now are.

Mr. Solon Robinson.—Upon the matter of strawberries I doubt whether a dozen persons present believe that a crop ever grew, even on a garden bed, at the rate of "720 bushels to the acre," notwithstanding I have heretofore had similar statements of what is possible with this fruit.

Mr. Thomas Cavenach said it had been often stated of late that the Wilson strawberry was not sure for more than one crop. This is a mistake. They are not sure, because their rank growth and great productiveness exhausts the soil. If the bed is covered in autumn, not with straw or sedge, but with an abundance of good, rich, fine manure, it will prevent the frost from heaving out the roots, and the second crop will be better than the first.

Mr. W. S. Carpenter said it was also important to keep off the runners, and then, if covered as suggested, the Wilson vines will continue to bear well for years.

VENTILATION OF FARM-HOUSES.

Dr. John B. Rich earnestly appealed to farmers to give their dwellings better ventilation. His attention had lately been called to this subject by finding such a large portion of the females in ill health which he attributes to the effect of badly ventilated houses, particulary the old-fashioned sort with low ceilings and no openings, where the old fire places have been closed up and cooking stoves substituted. He inquires if it is possible for a family of eight or ten persons to be healthy in a small room, with a cooking stove and all the cooking and its effluvia mixed with the air. Is it any wonder that the women exhibit such pale faces and feeble bodies. He also spoke pretty strongly of the mode of cooking, and the general want of good wholesome food in farm houses.

Mr. Wm. S. Carpenter.—I think the houses in Westchester county are well ventilated, we are a people of progress, we do not follow—we pretend to lead, we raise as fine crops as are to be found anywere, our horticulture stands high.

Dr. Parker of Ithaca, contended that farm-houses in that part of the state are as well ventilated, and the people as healthy, as in the city, and as a general thing that the cooking is better, and the general style of living better in farm-houses in central New York than in New York city.

Mr. Enos Stevens answered these arguments by a statement that in some part of that state, the same question having been mooted, a census was taken of the actual condition of dwellings, in regard to ventilation etc., which proved that the best ventilated houses, and those kept the most cleanly, and where the food was supposed to be of the best quality, and most carefully prepared, showed a greater amount of sickness than those of the reverse order. "The same thing, he said, had been proved by the statistics of cities; that is, that high ceilings, which some gentlemen have dwelt upon as important, and well ventilated rooms, and great cleanliness of persons, dwellings and streets, do not show the greatest degree of health, nor vigor of constitution, as fewer children are born in such residences, and of those born only one-sixth as many grow up as of those born in the meanest tenements. These are stubborn statistical facts, against the argument of the necessity, in a health point of view, to improve our dwellings."

Adjourned. JOHN W. CHAMBERS, *Secretary.*

Mr. Nathan C. Ely in the chair. *March* 1, 1864.

SNOW THE POOR MAN'S MANURE.

The Chairman propounded this question, in view of the snow then falling, and alluded to the popular opinion that spring snows, which fall upon unfrozen earth, are in some way enriching to it so that the appellation of "poor man's manure" has been applied to them, and he wanted to know if any one present could tell, and if they were enriching, why? Is it ammonia or electricity that the falling snow gathers and conveys to the soil? And in what condition should the soil be to be most benefited?

Dr. Ward said that he had always supposed that the enriching quality came from ammonia, which exists at all times in the air, and has affinity for water, and is brought down in every shower, and he supposes that the flocculent character of the snow has a greater capacity to absorb ammonia, and that is why it is considered "the poor man's manure."

Mr. Solon Robinson.—Let us start fair with this question. In the first place, does any body know that the snow that is falling to-day, or one that may fall later in the spring, will enrich the soil any more than the same amount of moisture falling in the form of rain?

Dr. Ward said he never had heard this fact disputed, and he thought that a popular belief of the people, so long undisputed, was evidence of its truth.

A late snow in spring has always been spoken of as a fertilizer of the soil. This belief is almost universal.

Mr. Robinson replied.—So is the belief, in some communites, that fence rails will rot in half the time if laid in the old, than if laid in the new of of the moon. Belief does not make facts out of theories.

Dr. Trimble thought it very unsafe to base anything upon popular belief.

Mr. Wm. S. Carpenter.—I believe in the benefit of snow. It is not theory with me. I am sure of it. But the benefit is not in the fall of snow, but in its service as a blanket upon the earth. He does not believe in the ammonia theory, because it is not probably very abundant in the air at this season, nor would it do much good if it came down with the snow upon frozen ground, but a good thick blanket upon the earth does do it good. We all know how the earth warms under a thick coat of snow.

Mr. Adrian Bergen said that his experience was that snow was beneficial by covering the earth in winter,but he had never seen any good from snow that fell and soon melted off late in the spring He had often seen the evil effects of a driving snow falling upon plowed land in drifts composed of half snow and half dust of the field. He doubts the truth of the manure theory of snow.

Mr. R. H. Williams.—The reason why March and April snows called the poor man's manure as assigned by science is that they bring to the earth in their floccular form of snow flakes a larger amount of the ammonial vapors that are always afloat in the atmosphere, and thus convey this most valuable stimulant of vegetable growth immediately in contact with the earth and the vegetation upon it, and holds it there in a condition to allow its absorption by the vegetation on its surface in a manner peculiarly applicable to the necessities of the case.

Rain showers are also thus beneficial in conveying ammonia to the earth, but being usually followed by sunshine and heat, the ammonia is again soon vaporised and reconveyed to its aerial sphere, while the snow holds it in suspension until a much larger proportion is absorbed and fixed by the plant on the earthy material surrounding it, applicable to its use when required.

Says Leibig.—"Experiments made with great care prove the presence of ammonia in rain water beyond all doubt."

Again he says :—"Ammonia may likewise be always detected in *snow water.* The inferior layers of snow resting upon the ground contained a quantity decidedly greater than those upon the surface.

Thus it is shown that ammonia is always omnipresent in the atmosphere, is always found in rain water and in snow. It only remains to be shown that it is essential to vegetable growth to prove that both *snow* and *rain falls* are valuable in a *manurial sense* as the medium of conveyance for this and all important stimulants.

Leibig gives as the conclusion of all scientific investigation : "We cannot suppose that a plant could attain maturity, even in the richest vegetable mold, without the presence of matter containing nitrogen, since we know that nitrogen exists in every part of the vegetable structure."

Says Saussure: "From experiments which have been made on this point, it is certain that plants receive their nitrogen only from animal or vegetable extracts, or from such ammoniacal vapors as they may find in the soil, or extract from the air."

Again, Leibig says: "No conclusion can have a better foundation than this—that it is the ammonia of the atmosphere which furnishes nitrogen to plants."

Again, "carbonic acid, water and ammonia contain the elements necessary for the support of animals and vegetables." The same substances are the ultimate products of the chemical processes of decay and putrefaction. All the innumerable products of vitality resume, after death, the original form from which they spring.

Here we have the highest scientific testimony as to the importance of ammonia. I will add in evidence of the complete practicability of the theory of snow and rain falls, being the medium of conveyance of vaporized ammonia from the atmosphere to the earth, two or three well established chemical facts and demonstration.

First, ammonia is a light colorless gas. It is both exhaled from volcanic action from the earth, and is always a product of the decomposition of all vegetable and animal matter. Its elementary constituents are one part nitrogen, and three parts (or volumes) hydrogen.

Water readily and rapidly absorbs it, even to the extent of five hundred times its volume. Ammonia is also an alkali.

Thus do each and all of its characteristics and conditions verify the propriety and correctness of the common saying that "spring snows are the poor man's manure."

The theory of the early or even fall or winter sowing of plaster or gypsum is thus shown to be the true one, as it absorbs ammonia largely, and holds it in a fixed state for the use of the contiguous vegetable demands. Gypsum also requires a very large amount of water to render it soluble and in a condition to impart its ammonia to the surrounding plants. There it is that the influence of gypsum is but comparatively slight on dry ground and pastures in times of drought, unless the ammonia has been previously dissolved by copious rains or snows, and absorbed by the roots of the plant and the earthy material in contact.

A Cure for Cabbage Fleas.

Caroline S. Helm writes from Wabash, Ind., for the benefit of the unfortunate "Maine man," whose cabbage plants are eaten up by fleas, that she settled the pests as follows:

"My husband had been engaged in a famous tobacco speculation and had plenty of the 'noxious weed' on hand. 'Nothing formed in vain,' thought I; and, acting accordingly, I made a bucketful of strong tobacco tea and sprinkled the bed with a watering pot. It was perfectly effectual. I have frequently tried the same thing since with the same success, not only on cabbage plants, but on other insects and other plants, such as young cucumbers, &c. My tobacco remedy I do not think will prove a preventive to 'human thieves.' I dare say they use a plenty of the weed now. I would respectfully suggest a little powder and lead, judiciously applied, in their case."

Dr. Trimble.—That is decidedly a good letter. I am glad the lady has found one useful purpose for tobacco, and I like her way of telling others how to get rid of the little pests.

Mr. Solon Robinson read a letter from Wm. D. Cook, Sodus, Wayne Co., N. Y., as follows:

"As a reader of the discussions of the Farmers' Club, I have concluded that it may be of interest to all concerned to communicate the result of an experiment made by me last summer to demonstrate the value of a compost of salt, one part, gypsum, two parts, and leached wood ashes, four parts, as a manure and stimulant for Indian corn. The experiment did not consist so much in applying as in omitting to apply the compost to a couple of rows across the lot. For I have annually used the mixture in about the same proportions, and in substantially the same manner, for more than fifteen years, and in fact have not planted a crop of corn for that length of time without using it, and with uniformly similar results, and occasionally tested in the same manner. The corn was planted on the 28th day of May, on a field of about twelve acres of old sod, about half of which had been mowed annually for seven or eight years, and the remainder for five or six. Soil a gravelly, clayey loam, with a mixture of red sandstone and granite bolders, having an impervious hardpan subsoil, sloping to the north, and about half a mile from the shores of lake Ontario. The field received all the long manure made the previous winter on a farm of two hundred acres by about thirty-five head of horned cattle, sixty sheep, nine horses and colts, and six swine. This was spread as evenly as possible over the surface, and plowed under to an average depth of about eight inches, with a double Titus plow, which folds up the sod with the manure between, laying it in the bottom of the furrow, and covering it entirely out of sight. The ground was then rolled and thoroughly dragged, first lengthwise of the furrow, and then diagonally, to prevent confusion of the drag marks with those of the marker, rows three and a half feet apart each way. I consider it essential to the best effect of the compost that it be applied as soon as possible after planting, viz: the same day, or at least the day after. In this case it was applied the next day after planting. There was no particular pains taken in selecting the rows for experiment, except to see that none of them were either on a back or dead furrow, and they were about in the center of the lot. In all respects, except as to the compost, the treatment was identical. In September the two rows were cut up by the ground in the usual manner, and set up in stooks to cure by themselves, and at the same time the two adjacent rows on the west were similarly treated. On the 12th of November the two parcels were carefully husked and weighed in the ear. The two rows without compost yielded: sound corn, 281 pounds; soft corn, nine pounds; total, 290 pounds. From the two rows with compost: sound corn, 388 pounds; soft corn, five pounds; total, 393 pounds. The stalks were not weighed, but by estimation the increase of fodder was in still greater proportion, and abundantly sufficient to pay the cost of material and application of the compost, leaving the increase of grain a clear profit. And it will also be seen from these figures that the benefit was not confined to *quantity*, but that the larger amount of yield was accompanied by a less proportion of poor corn. But not to be tedious, I will close with a description of the mode of preparation and application. First, I sift through a coarse sieve, measure and spread evenly upon the barn floor, the requisite quantity of leached ashes for the field, to be dressed at the rate of two bushels per acre. On the top of this I spread, as evenly as may be, at the rate of one bushel of gypsum (plaster) per acre; on top of all, at the rate of half a bushel of common salt per acre, carefully mashing the lumps so as to facilitate mixing; then with hoes, shovels and rakes the whole is thoroughly incorporated, so as to produce a homogeneous mass. The mixture should be applied soon after preparation, so that in the resultant chemical action the gas evolved may be carried by the dews and rains into the soil for appropriation by the sprouting corn. As will be seen, this allowed three and a half bushels of the compost per acre—about an ordinary salt barrel full. It is applied with the hand, from a pail or other convenient vessel, a small hand or about a heaping tablespoonful, directly on top of the hill. One man or boy can apply it as fast as six can plant. By spatting the hill with the hoe on covering the corn, the operation of dressing will be facilitated. The effect is manifest from the first appearance of the blade above ground, in the rich, dark-green color and rapid growth, and is more marked in dry seasons than in wet.

Mr. W. S. Carpenter.—I am well pleased with this letter, as it fully agrees with my own experience, although I greatly prefer unleached ashes, and would always apply them upon the surface.

Dr. Ward.—I have always doubted whether leached ashes possessed any value of consequence. There is very little potash left in those used by the soap boiler. I have used unleached ashes to great advantage; so I have plaster and salt.

Mr. R. H. Williams, said his experience was in favor of using ashes in the hill instead of on the surface.

Mr. W. S. Carpenter replied that he had seen corn crops much injured by putting ashes in the hill, but when used on the surface they never fail to greatly benefit the corn.

SOAP-MAKERS' WASTE—ITS VALUE.

Mr. Robert Cushman, Pawtucket, R. I., writes a letter of inquiry about the value of the waste of soap manufactories, consisting of ashes, soda ash, sal-soda, potash, and the lean-meat refuse of the grease, together with bones, &c., and lime used with the soda. He says:

"All the waste (except the wood-ashes, which are deposited by themselves, and whose value is fully appreciated), spent leys, lime, dissolved lean meat, some softened bones, &c., is thrown into a pile for sale. The question is, What is its value? There is *strength* enough in it to soften bones, or take off the hoofs of hogs running upon it. Is it such soap-makers' refuse as this that Professor Mapes speaks of as being comparatively valueless? Most of us think it very strong manure—properly used, a good fertilizer. We would like the opinion of the Club. As the establishment is new, we have not had an opportunity to test it long. The most liquid portion of it is kept from running away from the heap by a wall of horse manure, which a 'book farmer' of our acquaintance says is spoiled by the operation, or at least is not worth near so much for it; we had supposed it much more valuable. What do you think? Another question. We have a chance to get a plenty of bones, and the soap-makers tell us they will readily soften by burying them in wood-ashes. Is the chemical effect good or bad? I think many farmers and amateur gardeners like myself will like to hear your opinion. Dissolving them in vitriol or sulphuric acid is too troublesome for most of us, if there is any other way nearly as good."

Mr. Solon Robinson.—I will answer the question, that this is not the kind of waste spoken of as valueless by Prof. Mapes. That was the waste lime, which, after it had been used with the soda, was in the condition of powdered limestone or chalk, and not worth the expense of hauling and application to land.

Dr. Ward.—The value of horse manure consists greatly in the amount of ammonia it contains. Exposing it in the manner spoken of, in contact with the waste, part of the ammonia is partly absorbed by it, or else is liberated and goes into the air. Lime always injures manure. As to dissolving bones in ashes, that plan has frequently been commended by this Club. Mr. Carpenter and Dr. Ward both recommended mixing this waste in a compost of muck or loamy earth.

Mr. R. H. Williams.—I answer. Most assuredly it is. The material is composed of animal matter in the shape of *fat*, *fibre*, and *bone*, combined with alkali—usually both *potash* and *soda*.

There can be no combination of crude material better calculated to furnish not only valuable manure, but a large quantity, by being combined with *neutral soil*, and allowed to decompose and impart its valuable properties of *carbon*, *ammonia*, and *phosphates* to the mass in such proportions as to render it adaptable to the use of vegetation.

THE BEST WAY TO KEEP CORN FODDER.

Mr. D. A. Lillie writes from Geneva, Ill., that when he lived in Vermont, he was very successful in preserving corn fodder, in the following manner: "Cut up as soon as hardened, dried in stacks, then husked, and then put up in small stacks, salting them at the rate of three or four quarts to the ton. This kept them moist without mouldering, so that stock ate them entirely, tops and buts. For fear of giving too much salt they were given only once a day. The corn raised was an eight-rowed, long-eared kind, that did not grow very large, but would yield more to the acre than the large dent kind, common at the West. Whoever adopts this method of keeping corn fodder, will not abandon it."

VALUE OF COOKED FOOD FOR MAKING PORK.

The writer of the above letter also says that "a long series of carefully conducted experiments heve established the following facts in regard to making pork, to wit: That fifty pounds of good, whole, raw, dry corn, judiciously fed to a good breed of hogs, in clean, comfortable, well ventilated pens, will produce ten pounds of pork; the same quantity, after being soaked and fermented at least three days, will make 15 pounds; the same quantity ground and fermented, 17½ pounds; the same ground, cooked and fermented, 21 pounds. If the hogs run at large or in a small field, and are allowed to root, about one-third more grain will be required to produce the above result. As pigs less than four months old do not do well upon corn alone, the above experiments were conducted upon older hogs, and their weight or value at the commencement of the experiment taken out of their weight at the time they were butchered. From the above facts the cost of pork can be readily ascertained anywhere, and under almost all circumstances, by knowing the value of the corn fed. The value of the manure should be considered, as paying more or less toward taking care of them, which value will vary considerably in different localities, but it is quite valuable even here in Kane county, Illinois."

Mr. John G. Bergen.—This is a valuable letter. Something will always be due to the comfort of the hog, as to the gain he will make upon a given quantity of feed. In fatting four hogs lately, I have found that they gained faster upon corn meal than upon whole corn. This man makes them gain more than twice as much upon cooked meal as upon whole corn. At first view it would strike an inexperienced person as decidedly economical to prepare the grain in this way, yet it would require very nice experiments, varying with the circumstances of each person, to know which plan would be the most economical. In Illinois, hogs are frequently turned into the corn field, because it is not economical even to harvest the corn, much less to shell and grind it.

Mr. Geo. Bartlett.—The Massachusetts State Agricultural Society offered a prize for the best conducted experiments in feeding pigs, and the report of the trial upon which the prize was awarded to some one in Springfield, demonstrated that pigs gained in weight faster upon uncooked food than upon cooked.

Magnesian Lime Injurious.

Mr. Hiram Walker, writing from Salem, Washington county, N. Y., says that he found, upon a visit to Chester County, Pa., that all the farmers used lime with the most beneficial effects. Upon stating to them that lime which he had used did not prove beneficial, he was told that it was because the lime contained magnesia, and that they carefully avoided the use of such lime, having it tested by a competent person, and if found to contain magnesia, it was always rejected. If this is a fact, all farmers should know it. Can the Club or any other person, give any information? Mr. W. says: "Some years ago, I sowed three bushels of winter wheat. The first bushel I rolled in plaster, the second I sowed dry, and the third I rolled in lime. It all winter-killed alike badly, leaving not more than one-third standing. Now for the result. The plastered stood its head above the dry; the dry stood its head above the limed. It all had an equally good berry."

Mr. M. E. Thompson.—In New Jersey, there is a great deal of magnesian lime; I have seen good effects on some crops from its use.

Mr. Solon Robinson said that if composted within highly fermentable material, like horse or yard manure, it will first appropriate all of the elements of decomposition of such manures and finally generate so high a degree of combustion as to dissipate a large proportion of its most valuable properties. This is, in my view, the true system for composting all manures, viz: combine and surround all highly fermentable or chemically combustible matters with a sufficient amount of neutral or unfermentable material to absorb the volatile qualities and dilute all the elementary properties of the mass to a usable condition, without waste, either by evaporation or excess of quantity, beyond the required amount for nature's economical appropriation—otherwise composts become both labor and manure wastes.

Mr. Greenleaf.—In the discussion of the value of manure, I would observe that in the neighborhood of the Alps I saw, to me, a singular arrangement, the manure pen was placed near the door of the dwellings of the peasantry; into this pen was put every waste article—even the parings of an apple; this was applied to the soil at the proper season, and I must say that every portion of land was in a great state of fertility. After crossing into another region, where no manure heap was made, everything seemed going into decay.

Instinct of Animals.

A correspondent, in speaking of the muskrats providing winter quarters for a severe winter, he says, although the winter has not generally proved severe, yet the cold spell of January would probably have destroyed many of them, if their instinct had not taught them to provide against it. The more we observe the habits of animals the more we are struck with the entire fitness of each to its own sphere, and the wonderful instinct which most animals have for self-preservation and comfort. It is a matter of history that animals know and are sensibly affected by the changed atmospheric conditions preceding storms and earthquakes, before any difference is perceived by man. Gulls fly inland before a storm. In the country we have a peripatetic barometer in the lord of the barnyard. Who ever knew him to fly upon the fence on a rainy day, without seeing sunshine within an hour or two? So of most animals. They prepare in summer for winter, and if there is a "special Providence" for man, may there not also be for animals? For "God and His mercies are over all."

Sweet Corn for Green Fodder.

Mr. Solon Robinson—In answer to this inquiry, I state that some of the varieties of sugar-corn, which grow an abundance of stalks, are good sorts to sow for green fodder. There is not, however, as great an increase of sweetness, over other sorts, in the stalks as in the grain. The greatest advantage is that the stalks do not grow large, but may stand thick upon the ground and thus give a great burden of fodder per acre.

Cheap Fence Posts.

Mr. E. Baker, Dunkirk, answers the inquiry from Michigan about fences as follows:

"Place stones about sixteen inches and upward in diameter in line, with their upper edges in a horizontal line, throw up the dirt on each side with plow and spade, level or a little higher than the stones; drill an inch hole two inches deep; set in an iron rod two feet three inches long and $\frac{7}{8}$ diameter; provide two rails, one 2 × 3 and the other 3 × 3 inches, and of such length as suits best; make an inch hole through the first, and slip it on the rod, blocking it up four or five inches above the stones; in the other rail make the hole only half through, and place it on the rod ; nail on these rails the pickets, to suit your own taste—three feet long does very well; now plumb and straighten, and then fasten the rods by melted sulphur."

Stacking Hay Preferable to Putting it in Barns.

Mr. G. J. Locke writes from Danby Town Corners, Vt., that no better nor brighter hay is seen than that put up in the following manner: First, set up three poles from twelve to eighteen inches from each other, in the form of a triangle. Upon the poles nail slats near enough together to keep the hay from filling the space between the poles. Then build a platform round the poles from eight to twelve inches from the ground, and as large as the bottom of the stack is wanted. When the stack is built as high as proper, saw off the tops of the poles and cover them with hay from two to three feet, to prevent the water from running down the chimney. I should hang four poles over the top of the stack to keep the wind from blowing the hay off.

When to Cut Timber.

Mr. Locke recommended the last of August as the best season to cut trees for timber or fuel. The sap dries and hardens in the wood, and it is much heavier than when cut in winter, after seasoning. Always set fence posts top end down.

Plant Spring Grain.

Mr. Locke urges farmers to put in all the grain this season that is possible. He says: "I fear the people of the free States will have to furnish food for the people of the rebel States, or they will starve; and the great question is, 'Can we do it and not starve ourselves?' There is nothing like the usual quantity of coarse grain on hand, and who ever lives another year will find beef short." All this is very true, but, with a scarcity of laborers, how is it to be done, until we can end this war and liberate a host of willing laborers.

Minnesota Fruit-growing.

Mr. Solon Robinson—The Legislative Farmers' Club of Minnesota have been discussing the question this winter whether apples can be successfully grown in that State. The general conclusion appears to be that, notwithstanding all the losses of young trees that have occurred, to the discouragement of many persons, they can be successfully grown if planted in sheltered situations, or if the young trees are protected with boards or some artificial shelter. The following list of hardy sorts of apples for Minnesota, was given by Mr. Lee, of Hudson:

Red Astrachan, of Russia, summer variety; Duchess of Oldenburg, of Russia, fall variety; Tallman Sweet, of Rhode Island, winter variety; Winter Pippin, of Vermont, winter variety; Red Canada, of New England, winter variety; Bailey Sweet, of Western New York, Fall variety; Fameuse of Canada, Fall variety; Alexander of Russia, do.; St. Lawrence, of Canada, do.; Calin Pippin, of Upper Canada, do.; Gravenstein, of Germany, do.; Flemish, of Germany, do.; Northern Sweet, of Keeseville, N. Y., do.; Hawthornden, of Scotland, do.; Keswick Codlin, of England, do.

He recommends planting orchards, in all cases, upon a northern slope, in preference to any other aspect. The ground should be cultivated several years before planting the trees, and afterward with some low-growing hoed crop. Young trees should all be carefully staked, to prevent injury from sweeping prairie winds.

Mr. R. H. Williams.—I should like a subject discussed which, I think, would be very valuable for our farmers. Which is the most beneficial, the large or small clover?

Mr. W. S. Carpenter contended that there is no difference in the kinds; it is only the effect of climate.

Mr. John P. Veeder.—I was told by a large dealer in clover seed at Albany, that if Schoharie clover seed was sown in Ohio, it became the medium clover.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

March 8, 1864.

Mr. Nathan C. Ely in the chair.

The chairman read the following communication from Mr. L. W. Whiting, Northfield, Minnesota:

To the Farmers' Club of the American Institute:

GENTLEMEN—For the last year I have been a silent but interested observer of your weekly doings, and am glad that there is a fountain constantly open from which all in our broad country can obtain encouragement and reliable information while engaged in the patriarchal occupation of agriculture.

Gentlemen, you must be self-sacrificing—for if your business "pays," "I don't see it."

I am one of the very few men in the North who have been injured by the rebellion, and as I am now taking my first lessons in farming, at the age of fifty, I ask light on the following points:

I have a piece of ground with an eastern exposure—naturally rich brush land—has been cropped five or six years without manure. Question—Should it be manured before setting out Delaware grapes the coming spring? If so, in what way?

I assume that carrots are the best root, all things considered, for cattle and horses. Question—Are they equally so for hogs?

I assume that fodder, as a general thing, is most conveniently procured by sowing corn. Question—Must the crop be cradled and bound in bundles? and what is the best corn for the purpose?

Of medium and marrow beans which is the most prolific, and should they be planted in drills or hills?

What variety of sorgo is earliest or best for this latitude?

Climate of Minnesota.

Allow me to add a few sentences that may be of general interest.

It is true we have very cold weather in this State, but the *extreme* cold lasts only two or three days, otherwise the winter season is of *even* temperature—cold and dry, seldom raining or thawing. Spring comes as early as in middle New York, and is much more decided.

The whole summer season is that of several degrees south—never a superabundance of rain, no fog or damp, muggy weather, and less trouble with frost than in Western New York. The fall season is invariably dry and sunny, and the plow runs till the 20th to the 25th of November, when it is stopped by the frost.

The wind blows from a pleasant breeze to almost a gale three-fourths of the time, except in winter, when it is generally still.

All domestic animals are very vigorous and healthy, and we believe it is the greatest country in the world for breeding sheep, and from the fact that the ground does not thaw until it should, in the spring, we believe that grapes, apples, &c., can be cultivated with better success than in many regions where the freezing and thawing process is going on through most of the winter, though it may be farther south.

Mr. Wm. S. Carpenter answered that Delaware vines required better ground and better treatment than several other sorts. He recommended to pulverize the land deeply, and manure it with old, well-rotted stable manure or compost, or with fine bone, superphosphate or wood-ashes, and to cultivate the ground carefully while the vines are growing.

Prof. Mapes.—In reply to the inquiry in relation to the question whether carrots are good for hogs as they are for horned-cattle and horses, I say no ; but parsnips are. Carrots do not contain a very large amount of nutriment, and their value for feeding is not on account of their nutritious properties. It is owing to the pectic acid which they contain in larger quantity than any other roots used for feeding, and this assists the animal to digest other food and obtain its nutritive qualities in much larger amount, so that a peck of oats and a peck of carrots a day fed to a horse would do him more good than a half bushel of oats without the carrots.

Another question propounded by Mr. Whiting was upon the value of corn sowed for fodder, and whether that of sweet corn was greater than of other varieties ; also, whether it should be bound in bundles for curing.

This question was answered by several gentlemen to the effect that it is not worth while to bind the corn ; it cures better set up in stocks, tied together at the top, and sweet corn is the best variety for fodder.

The question whether beans should be planted in hills or drills found advocates for both plans, but all agreed that the kind known as *marrow beans*, a large, roundish, field bean, is the best variety known.

Natural Grafting.

Mr. Le Roy Whitford, Harmony, Chautauqua county, N. Y., sends us the following interesting account of natural grafting of forest trees :

"Some fifteen years ago, a natural curiosity was to be seen by travelers on the Lake Road, on the west side of Chautauqua lake, about four miles from Jamestown, in the town of Busti. It consisted of a beach tree with two trunks, rooted about twenty feet apart, and approaching each other till they united in one, at the height of twenty-five feet. Above this junction the tree was smooth and straight, with a regular and handsome top about eighty feet in height. Hundreds of travelers have seen this singular tree and scores have cut their initials in the bark. It was blown down some years ago. Another, every way similar to the above, was blown down a few years ago on my own farm.

"But a still more curious phenomenon of this kind is to be seen on the farm of Mr. F. Orcott, in Erie county, Pa., two miles south of Union. Two straight beech trees stood about six feet apart. One now is about ten inches and the other about twelve feet in diameter. About half way up, say thirty feet, they are united by a limb six inches in diameter, which is smooth and free from twigs or branches, and starts from each tree in an upward direction, thus forming the arc of a circle. About twenty years ago, some vandal cut off the smaller one, and the stump having decayed and disappeared, the body is now suspended in the air, while the other tree stands firm, and yields a kind of maternal support through this umbilical connection. The tree in the air is alive, and shows unmistakable evidence of annual growth down to the very butt, which is three feet from the ground. I noticed many branches of recent growth below the uniting limb. The suspended tree is subject to quite a pendulum motion, and is liable to be destroyed by wind unless the owner employs some means to protect it, which he certainly should do without delay.

"Two questions naturally suggest themselves:

"*First:* How could such a union of forest trees take place without the aid of man? And,

"*Second:* If it is the work of the aborigines, how were the trees kept still long enough for the union to be perfected at such a height?

"What says the Club? What say naturalists? I have no theories or speculations to offer, but will simply suggest a plan whereby any one who has a home to improve and beautify, can solve the mystery in a very satisfactory manner. Procure from the thicket two tall, slim beech saplings with good roots. Trim them like fishing-rods, only leaving a few twigs and small branches.

"Take them to your best gate, or where it shou'd be, at the main entrance to your premises from the public road; entwine the upper ends carefully around each other without withing or otherwise injuring them. Set them so that they will form an arch over the gateway high enough to clear anything that will be likely to pass under in a century. If properly done, a few years will solve the mystery to your entire satisfaction, for you will have one of the most beautiful ornamental gateways in the country. You will probably put a few loads of gravel where the wagon ruts are now, and your children's children will rise up and call you blessed."

Mr. Wm. S. Carpenter remarked that this was like the plan of in-arching fruit trees, which has been much practiced in France, where a hundred pear trees are sometimes all united together by the limbs, and if the trunk of any one was severed, its life would be continued by the support of those at each side.

Mr. Geo. Bartlett remarked that he had spent many of his youthful days in Massachusetts, under the shade of two trees, white oak and black oak, joined together by natural grafting. He had also seen two pines joined together in the same way. Perhaps natural grafting is more common in beech trees than in any other kind.

Mr. John P. Veeder said that he had seen a natural graft of an aspen tree, where a limb formed an arch of about two and a half feet, and then joined the body again. He said that upon his place there was a pine tree which appears as though growing directly out of the body of an oak. The two evidently had started together, and the oak growing faster than the other, had completely enveloped the roots of the pine.

Mr. Solon Robinson.—The great value of this letter and our discussion upon it, is what is suggested by Mr. Whitford, that we might make use of the knowledge obtained from this natural grafting, to obtain living gate posts, surmounted by an arch of growing limbs.

CULTIVATION OF FLOWERS—HOW TO PRODUCE DOUBLE BLOSSOMS.

Mr. Robinson read the following extract of a letter from a lady of Belfast, N. Y.:

"I desire to know the mode of culture necessary to raise seed which shall produce large, double flowers of asters, balsams, stocks, &c. I have cultivated them many years, but my finest blooms mature but little seed, and that results the next year in inferior flowers, so that I am obliged to depend entirely upon seed furnished at seed stores and often find that untrustworthy."

Mr. R. G. Pardee said: It gives me pleasure to answer such sensible inquiries. The remedy is easy and complete. The best seed in the world will always produce some single blossoms, and these give off hybridizing pollen, more readily than the most double kind, and this fertilizing nearly all the blossoms in the vicinity, will cause them to produce seed that will grow none but single blossoms another year. To prevent this, watch the opening blooms carefully, and pull up every plant, without exception, that shows only single flowers. Continue this process every year. To enable your double blooms to produce seed, pull out some of the pistils, so that the pollen can find room to enter to produce fertility. Some double flowers are so thickly studded with pistils that the pollen falls only upon the extremities, and is blown off, consequently very few seeds are produced. Seedsmen are in the habit of making use of artificial means to obtain seeds from their best flowers, and then they get very few, and this is one reason why the price of such seeds is always so high. Some persons are in the habit of transplanting balsam three or four times during the season, taimming off the roots, and setting the plant each time in a very rich spot. This greatly improves the beauty of the bloom. Asters will not bear this treatment. Now, if the lady will be sure to get good seed, and pursue the course recommended, eradicating every single blossom, without fail, she will be able to grow double flowers.

ISABELLA GRAPES IN MARCH.

Mr. Wm. S. Carpenter presented a box of Isabella grapes from Wm. Prentice, Pultney, Steuben Co., N. Y., which appear plump, sound, and handsome as though just from the vines, where they were well ripened, but they have very little of the good flaver that we admire in grapes. Yet these find purchasers at 25 cents a pound.

PEARS PRESERVED IN HAY SEED.

The Chairman presented some pears which he put up in autumn in hay seed, which were found mostly decayed when opened, and all might as well have been, for those still sound ones are poor eating—not half as good as some apples presented by Mr. Carpenter, local to Westchester county, and described by Downing as the Golden Pippin. He says that he considers them best for this time of the year, of any of his 300 sorts. The Geneva Lady Apple, presented by Mr. Carpenter, was much admired; it is of large size, smooth, and handsome hale red color, and excellent flesh.

WHEN TO SOW PLASTER.

Mr. Andrew Tuck, Flackville, St. Lawrence county, N. Y., wants to know, "At what time in the spring is it best to use plaster for fertilizing meadows? Two opinions prevail here—one that it should be sown before the heavy rains if possible, and the other the opposite. 2d. What kind of spring wheat is least liable to be damaged by that insect of the beetle tribe called weevil?"

Mr. John P. Veeder said that many farmers near Albany prefer to sow plaster in the fall, but he prefers to sow it on the grass when wet with dew or rain, in June, as it then combines with ammonia at once. Plaster is inert until dissolved, and it requires a very large quantity of water. In some places it appears to be of no value.

As to the answer about spring wheat, no one here can give any answer that will be of any value in St. Lawrence county, because what would suit there would not here.

Mr. Solon Robinson—Mr. Carpenter is of opinion that no spring wheat will succeed in this vicinity well enough to make it worth cultivating. He has tried several sorts, and found that each gave a poor yield, and made poor flour. The best variety that he had tried, came from seed obtained from the Shakers of Lebanon, New York.

BEET SUGAR.

Mr. H. Wheeler, Columbus, Wis., wants to know how to make beet sugar. "Why is it that it is not made in this country, as it is in France and Belgium? Is our soil deficient, or climate unsuitable, or industry or enterprise not equal to the undertaking, or do we lack the knowledge? I have made some small experiments without any satisfactory results. I shall try again, and I wish for more knowledge. Where shall I get it?"

Mr. Solon Robinson—In answer to this, the gentleman is informed that there are no successful beet sugar works in operation in this country, unless one for which machinery was imported last year to Illinois has been started. About 100 acres of land was planted with beets last season, for the purpose of manufacturing sugar, but we understood that the works did not get ready in time.

ARE THERE TWO KINDS OF RED CLOVER?

This question was called up last week, and this week some one brought in two boxes of clover seed, said to represent two varieties. Mr. Pardee said that he had always understood that there were two sorts, and had, when a merchant in Central New York, bought large quantities of both sorts, and the seed of the two looked so exactly alike that no man could tell one from the other. There was a difference in growth, and the small sort will produce a hay crop and seed crop the same year; but the large sort will produce only one crop. Its greatest value is to turn under as a manure crop.

Mr. W. S. Carpenter said that what was called large clover he thought was lucerne, which is only valuable for soiling or for a manure crop.

Mr. R. H. Williams.—To the enquiry made at the last meeting, which of the varieties of red clover, the early or June variety, or the late and larger variety, is the most reliable to the farmer.

The first query suggested by many is whether there is more than one decidedly characterized variety of the red clover. *Trifolium, three leaves,* being the class name given to it by botanists.

The answer to this mistaken notion—for it cannot be an opinion intelligently acquired—will be found by consulting almost any work on botany, when there will be found several varieties and two decidedly distinct species whose characteristics are marked and decided, viz:

1. *Trifolium Reflexum* starts early, matures in June or the forepart of July. If allowed to stand the stalk ripens to the ground and only throws out new stalks and leaf from the root. Valuable for early pasture and hay, producing a crop of seed after being mown in June.

2. *Trifolium Pratense*—(*Wood's Botany.*)—This species starts later and grows less rapidly in the early part of the season. When grown and used for hay, blossoms and matures about the same time with timothy, and is mixed with that grass for that purpose with advantage, maturing late in July or first of August. When used for pasture, and fed off about the time of blossoming, will continue to throw out new leaves and heads from the *original stem* throughout the season of pasturage. For seeding it requires to be kept back by pasturing until about the 10th of June, and then allowed to go forward to maturity, ripening its seed about the last of September. It is also characterized by a much larger and more spreading stalk, and also a larger and longer root.

I prefer this species for general use, as it affords more pasturage and more hay, more root and more coarse stalk, to be left on the ground for its covering and sustenance. Costs no more, and pays, everything considered, nearly double to the producer that the early maturing species, except, perhaps, when raised expressly in view of a crop of seed.

To the farmer who values clover as a recuperating source to his hard run land, it has the promise of realization.

No land in this latitude that will grow clover need ever become poor if plentifully plied with that crop and plaster, sown early and freely upon it, as it draws its main sustenance from the atmosphere and deposits it where your wheat and corn can reach and use it in a form applicable to their enecessities.

Mr. Carpenter.—The remarks of the gentleman has not changed my opinion. I still consider there is but one variety of red clover.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

March 15, 1864.

Mr. Nathan C. Ely in the chair.

WHITE'S IMPROVED APPLE PARER.

Mr. Wm. S. Carpenter exhibited White's improved apple parer. This machine was invented by Mr. Jonathan White, of Antrim, N. H. He claims for it superiority to any apple parer now in use.

1st. As being less liable to get out of order.

2d. As being easier and quicker motion. The best parer now in market travels 108 inches in paring an apple, while this accomplishes the same by traveling 28 inches.

3d. In that the paring does not clog up the machine, as is the case with the best now in use.

The machine was tried in the presence of the members, and was very much admired for the rapid manner in which it worked.

RHUBARB WINE.

A. G. Nye, Libertyville, Jefferson county, Iowa, writes to inquire what more the Club has to say about rhubarb wine. "Agents who are selling roots assure farmers that it promises large profits to those who engage in the business. I am aware that it was talked about some time ago in the Farmers' Club, and I think Mr. Carpenter and others, yourself among the number, spoke of it unfavorably, and said that it was a pleasant, palatable wine, but weak and not of much value, and that no considerable quantity could be sold at a price that would pay for the cultivation of the plant and making the wine. The Farmers' Club being very good authority here, the unfavorable notice of the wine by them has prevented some from going into the business. Our physicians recommend it for their patients, and pronounce it a stimulant and tonic fully equal to the best grape wine. The question of most importance to us, who think of going into the business, is, can any considerable quantity of the wine be sold at a fair price, say two dollars per gallon, in the New York market, or any other market of the country? Will the Farmer's Club enlighten us?"

Mr. W. S. Carpenter.—I was in a cellar yesterday where I tasted a sample of twenty-five barrels of rhubarb wine, just sold at eighty cents a gallon. Compared with other rhubarb wine that I have tasted heretofore, I should pronounce this second or third rate. I do not think that the best could be sold in quantity at $2 a gallon. As I have never made any of this kind of wine, I cannot say what the product would be; but I have no doubt that it would be large; and, except the cost of sugar, I have no doubt that the wine can be made as cheap as cider, and as much produced from an acre. I have drank of this kind of wine that I considered really good. As to the selling price, producers must not look for two dollars a gallon, because grape wine can be profitably made for much less money.

Mr. Solon Robinson.—And because this rhubarb liquor can be made, so say those who have tried, and whose statements may be relied upon, at the rate of 2,500 gallons per acre, and it may be sold at 50 cents a gallon, and give good return.

Mr. R. H. Williams said that he had been informed that rhubarb wine was used to some extent in army hospitals ; that physicians had found that its peculiar acid promotes appetite for food, while it tends to destroy the appetite for alcoholic drinks, and in that case may prove a benefit to the world.

The Chairman said that the greatest use for this and all cheap wines sold in this city was for the purpose of "extending" imported wines ; that is, for reducing the value of the imported article by additions of other substances, while enough of the original is retained to give the new compound character and sale. There is in this city a very large manufacturing establishment of this kind. For instance, brown sherry is taken in and pale sherry turned out. Perhaps this rhubarb wine would be a valuable addition to this sherry manufacture. To give the extended wines strength and "body," an article made expressly for the purpose at the sugar houses is added, called "white liquor." It may be considered as rock candy in solution. That rhubarb wine that comes to the city and is sold wholesale is manufactured over again, is pretty certain, as it is never offered at retail.

Preserving Grafts.

Dr. Parker, Ithaca, N. Y., said that the best way to preserve scions is to dip every cut end in a strong solution of gum arabic as soon as taken from the tree. Then wrap them in paper to send abroad, or put them in a box with sand, and bury in the earth. This is better than in the cellar. There is no need of oiled silk to wrap scions, sent by mail, if they are gummed.

Mr. Wm. S. Carpenter said that he packed some scions in moss, and wrapped with gum-elastic paper, and they went to France in most perfect order. Strawberries sent in the same way were as fresh when they arrived as though just from the ground.

Fibrous Plants.

The Chairman read a letter from Samuel C. Allen, Stryker, Williams county, Ohio, in answer to the inquiry elicited by the old report to the New York Legislature, which Mr. Solon Robinson read some weeks since in relation to a new fibrous plant discovered by Charles Whitlow. Mr. Allen says that Benjamin Benson, Townsend, Huron county, Ohio, was well acquainted with Mr. Whitlow, and has seen the plant, which was described in Niles's Register, Vol. 3, page 188, and named *Urtica* Whitlowi, and was highly recommended by committees of scientific men. The fibre was very white and strong, and it was thought at the time that the discovery would prove of immense advantage to the country. The plant has many radical stems springing from one root, of a dark-purplish red or mahogany color, is smooth or glabrous, the leaves lanceolate, serrate, acuminate, sessile. Its natural location is upon moist, or rather swampy ground, in the latitude of New York.

Mr. Solon Robinson.—This information is interesting in a historical point, but if the plant really possessed such great value as a fibrous one, why is it that it has never been utilized? That it had ever been discovered seems to have been forgotten, until the accidental finding of the report that I read here. If it has a value, now is the time to re-discover it.

Sorgo in Michigan.

Mr. C. M. L. Andrus, Somerset, Hillsdale county, Mich., sent a sample of very handsome, well-granulated sorgo sugar, made in that State, notwithstanding it is pretty well up North. He says:

"Cane ground for myself and neighbors, last fall, averaged a gallon to the rod, or 160 gallons per acre, of a superior quality, preferred by most people to sugar-house sirup—most of it granulated. The past season was the fourth season that I have run the iron crusher, and I have averaged over 160 gallons per acre on all I have run; while I have run some jobs that far exceeded that. I run the cane from 46 rods of ground measured (not guessed at), that made ninety-three gallons of the most beautiful sirup, which granulated—a sample of which you will find inclosed in this note, that you may see whether sugar can be made from sorgo. I see by examining the report of the Hon. J. Stanton Gould to your State Agricultural Society, on the subject of sorgo, that we raise in this, or this section of it at least, twice as much sirup to the acre as he reports the average in Ohio and Illinois. Why is it? Because we, in many cases (contrary to his opinion), cut out the suckers and smallest stalks. I may have something to say on sorgo planting again, as it is often planted so shallow that it dries up, and cannot come up until the weeds choke it and keep it moist by covering the ground."

Mr. Solon Robinson—This letter is interesting and valuable, as demonstrating that sorgo is really well worthy of attention from all farmers south of latitude 42, and that probably it will succeed much further north in favorable situations.

Cabbage Fleas—How to Grow Cabbage Plants.

A farmer in Ashville, Chautauqua county, N. Y., says: "I want to tell my experience of ten years in the cabbage raising. I first learned of a Swedish woman. Seeing some very nice plants, I wished to know how she raised them without the lice or fleas destroying them. She said she took droppings from the hen-roost, a small quantity, a little new milk, enough to soak what seed she wanted to plant; put in her seed mixed all together, let it soak for a few hours—eight, ten, or twelve. She said fleas never would disturb the plants. I thought as I had lost plants from fleas eating them up, I would try her method of raising plants. For ten years it has proved a success. I select a sunny spot near the house, in order to have slops from the kitchen thrown on the bed of plants. I make the bed loose and rich by putting in leached ashes, and manure from the hen-roost. When the seed is soaked enough sow it on the bed, stirring it in well; then if it should be a drying sun, sprinkle on water often, say three or four times a-day. Sow the seed as early as the ground is fit to work, and set the plants in place when three or four inches high, and keep them well watered and the ground nicely worked, and you can raise cabbage."

The thanks of members were freely expressed for this timely information, which may enable every one to grow his own cabbage plants, which is now found to be so extremely difficult that the cabbage crop, as a general thing, is much smaller than it should be, as it is one of the most profitable ones grown.

Farming in Maine.

Mr. Edward C. Chase, North Yarmouth, Cumberland county, Me., says that Mr. Hocker, who wrote of farming in Maine, did not give a fair view of the case. Mr. C. says: "We are nearly all farmers here, and make a pretty good living, raising produce for Portland market. There are more potatoes raised in this town than in any other town in the State. We have a number of varieties, such as White Mountain, Jacksons, Davis's Seedlings, Oregons, and Long Reds. Our market price now is about 70 cents a bushel. As a general thing, they did not rot last year. Out of 350 bushels, I did not have one quart of rotten ones. I plant on pasture ground, without manure, or anything but plaster. I cannot get so great a yield, but I get good sound potatoes. I have adopted this plan for a number of years, and have never failed of a good crop. Potatoes want to be shifted as often as once in two years; they yield better, and are not so likely to rot. The only remedy I can find to prevent the rot is to plant without manure, and to plant early. We generally plant our potatoes first of any crop. The kind we call Oregons grow until the frost comes, and are very large, and yield better than any we have. There have been forty bushels raised from one bushel of planting. They will grow on any soil without manure, and yield well, but are not so saleable as Jacksons.

"We raise sweet corn for market to sell green; there is a great call for it to put up in cans, to send to all parts of the world. We get from six to twelve cents a dozen. We also grow a great many apples, and we find that this kind of farming affords a pretty good living for those who stay at home.

Root-Grafting.

Mr. Geo. W. Dean, Franklin Mills, Portage county, Ohio, wants to say a few words about root-grafting. He says: "There seems to be among Eastern men an unaccountable prejudice, except upon the hypothesis of a lamentable ignorance, against root-grafting the apple. All their objections to the system are based upon statements that are not true. I am somewhat familiar with root-grafting, as practiced in Northern Ohio and Western New York, and I think I am warranted in stating that no nurseryman, making any pretensions to respectability in the business, uses anything but seedling stocks, one to two years old; in rare cases three years, but they are always considered objectionable. Roots from an old tree are not used, and a nurseryman who would use them when he could get seedlings, would be a fit subject for a mad house. I have handled a good many root-grafted trees, and some budded ones, and I cannot see why one is not as good as the other. The objection to pieces of root being used has no force;

many think short pieces best, and certainly one three inches long is preferable to one ten inches or a foot. Three to four inches is as good as more, and these pieces may be used as far down as the root is healthy and of sufficient size. If old roots are used anywhere, it is unknown to me, and I do not believe it is practiced now to any extent."

Mr. Solon Robinson—Perhaps not to as great an extent as formerly. It is this kind of grafting that is objectionable. No member of this Club believes that root-grafting, honestly done, would not give good results; yet many who expressed their opinions on the subject seem to prefer trees that have been grafted or budded in the stock instead of pieces of root.

Of the manner of preparing the roots and scions for joining, a member stated that he had seen a common carpenter's plane used with great success. The operator takes it between his knees and applies the piece of root or scion till he gets the right bevel, and a little practice enables him to bring all the pieces to the same bevel, so that they fit together exactly, and in joining, all the care that is necessary is to pick up roots and grafts of suitable size, and lap them together, and wax and tie, and throw them in a pile. A man in Illinois who practiced in this way, prepared two acres of ground by high manuring, plowed in, and the scions set with one bud above ground in the spring, made such a growth during summer that a man was hidden a few rods distant in the nursery.

Mr. W. S. Carpenter said that although he decidedly preferred stock to root grafting, he was aware that nearly all the nursery trees sold are root grafted. He then distributed some scions of the Selleck pear, which originated in Vermont, and is one of our very good American pears, ripening in October. Of American sorts, he said, we now have some that begin to be appreciated, not only here, but in France. He mentioned the Bergen pear as one well worthy of attention. It is about as good and large as the Bartlett. In answer to the question, he said that he should prefer autumn planting of pear trees, upon well prepared, dry soil, never upon wet soil. He has commenced setting in autumn, while the leaves are green, and he has set trees in spring, after the blossom buds started, and had all live.

Mr. Samuel Miller, of Lebanon, Penn., says: There is nothing seems to grate more harshly upon my pomological ear than to hear a man say this or that, or these vines don't suit me; I will dig them up, and plant others that please me better.

This is most assuredly a great error. I consider them equal to whatever I desire to have there, save one years' time lost, providing wood can be procured of the desired varieties. I would rather give $5 for five good eyes of a new grape, than pay that sum for five vines of small ones, simply because, with these five eyes, I would count upon having at least four good strong vines in one season thereafter.

The question arises, How? It is by grafting, and this in the face of some of the knowing ones, stating and writing that grafted vines are short lived, and are not to be recommended. But facts are stubborn things, and I have them daily before me. Supposing you take a walk with me along my grape border, originally to contain eighty varieties, many of which proved worthless, but instead of digging up, were grafted and showed fruit the next season.

First, we come to a Roger, No. 3, next Kelly a seedling, Oporto, Roger's Hybrid, No. 4, No. 15, Maxatawny, Miles, Delaware, &c., at least twenty, now strong, bearing vines. Leaving this border, we can walk around the place and see some of the new and rare kinds growing on wild vines that sprung up accidentally. All these bear about two years sooner than if small vines had been planted, such as we usually get. I have frequently been tempted to sell all my wood and quit propagating, but it cannot be done until grafting is better understood. But this is becoming tedious to the reader ; he will want to know how this grafting of the vine is done. Here is my method :

In the first place, see that you get good, ripe wood, not less than one-quarter inch in diameter ; less may do, but is not certain.

Keep this damp in sand or moss in a cellar, until the ground opens in the spring (I have performed on February 22d with success) ; remove the earth about three inches deep, select a smooth place, saw off the vine six inches below the surface, unless that comes on the roots, in which case it may be performed near the surface ; pare smooth with a clasp knife, split down the stick in the middle, prepare the graft by putting one inch above the bud and three below, wedge it the same as other grafting, insert as usual, but be careful to have the line between wood and bark of stock and scion to be in an exact line with each other ; the outside must not be a guide, as the bark of the stock will be much thicker than that of the graft. Fit the graft in firmly, and if the stock is still weak, tie around it with twine or loose matting, so as to hold the graft firmly until it has caught hold by growing, by which time the bandage will decay, and not hinder the growth of the vine. Never use wire, as I have seen some recommend.

Now, take earth and press it closely and firmly around the joint of grafting, but be careful not to move the graft ; fill up to the bud ; leave the point stick out ; over this put loose manure or weeds, or anything that will prevent frost from lifting the graft out, "or your labor is lost." This will keep out frost, and will prevent your bud from drying out. About the time that vines begin to grow, it will be well to examine occasionally to see if the bud starts. The covering must be kept loose, and, as the graft progresses, taken away entirely. Suckers arising out of the root must be carefully removed, and after times a degree of patience is necessary, as I have known the grafts not to start until July, when they began and grew well, ripening most of their wood. When they start thus late, it is well to pinch the end of the shoots about the 1st of September. My usual success in this kind of grafting is about 90 per cent.

"TOMPKINS COUNTY KING" APPLE.

Dr. Parker called attention to this valuable apple, and hoped that in future lists of apples that promises well this apple would find a place.

Mr. Wm. S. Carpenter.—We have seen this apple, but I consider that we have a great many apples superior to the Tompkins county King. We all remember when the Northern Spy was introduced, it was thought by some to be one of the finest apples grown. Where does it stand now? By many thought to be only a second-rate apple. Location has a great deal to do with the quality of fruit.

We find some of the Newtown Pippin apples are green, and others yellow. Now, I believe there is but one Newtown Pippin, and but one Rhode Island Greening. The Spitzenburgh grown on the Hudson river is found there in greater perfection than in any other place that I know of.

Mr. R. H. Williams.—One word in relation to the Greening apple. I have seen apples of a green color grown in a great many locations, and all are called the Rhode Island Greening. These apples seem to me to be very distinct.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

March 22, 1864.

Mr. R. H. Williams in the chair.

THE WHITLOW FIBRE PLANT.

Mr. Solon Robinson.—The Club will remember at a former meeting a document exhumed from the State House at Albany, which spoke of the discovery of a new fibre plant by Charles Whitlow, and subsequently a letter of explanation of its value. I have received the following letter from Mr. John Goldie, Ayr, Canada West:

"In reading over the proceedings of the Farmers' Club of the 2d February last, I was much interested in the report of Messrs. Livingston and Genet, about the new and rare plant discovered by Charles Whitlow, as a substitute for flax and hemp. This was another of the humbugs practiced on the public. Mr. Whitlow was, I think, a farmer from East Lothian, Scotland, and came to Canada, for what express purpose I do not know, but, I suppose, to better his fortune. Although little acquainted with botany, he brought along with him the botanical transparencies of Dr. Thornton, and gave lectures upon the subject in Montreal and several places in the States. While in Canada he found out the fibrous quality of the *Urtica Canadensis* (Lapertea), or Canadian nettle, which is the wonderful new plant. Having gotten a quantity of the fiber prepared, he went to the States, lecturing on its superior qualities, and his statements were so believed that, although it does not seem that the Legislature gave him any money, yet he took out a patent for the manufacture of the nettle, and sold one-half of it to a company for a large sum—if I mistake not, $30,000. This seems to have been an end of the concern. I never heard any more of the business. Mr. Whitlow, after getting the cash, went to London, and turned quack doctor. I am surprised at the statement that Drs. Edy and Muhlenberg did not know the nettle. There must be some mistake about this. I have seen Mr. Whitlow, and was in Montreal soon after the nettle discovery. I had the report of what is stated above from several friends, who knew the whole concern, and also read it in the public papers of the day.

Mr. Solon Robinson remarked; This is probably the common nettle plant which grows all over New England, and of which we occasionally hear accounts of its remarkable value as a fiber plant; yet that value has never been fully developed, and probably never will be, as it never can compete with flax and hemp.

Bagasse for Manure.

Mr. L. C. Hough, Brownhelm, Lorain county, Ohio, asks: "Can you tell the value of sorgo bagasse, and the quickest and cheapest way of converting it into manure? I have a large pile of it, which I should be glad to turn to the best account. Many others are similarly situated, and we shall be glad of any practical information. Will you please bring the matter before the Farmers' Club?"

Mr. Lafayette Foster writes from Plainfield, Will county, Ill., on the same subject. He says: "Is the crushed cane, thoroughly rotted, as valuable as barnyard manure for farming land? Is the sorgo cane, unrotted, worth hauling upon farm land for manure?"

Wm. J. Townsend, Skaneateles, N. Y., said in reply to these questions: "There is a person in my neighborhood who has grown considerable Chinese cane, and esteems the refuse, when well rotted, as a very valuable manure. For the purpose of correcting the acidity he mixes with it a small portion of lime."

Other members stated that experiments with bagasse, of the true cane as well as Chinese cane, had proved it of very little value until it had lain several years, and become thoroughly decomposed, and even then it retains so much of its acid that it is apt to prove injurious to crops, unless mixed with lime, or composted.

Mr. Solon Robinson—The Louisiana planters think that the labor required costs more than the value of the manure. Some of them dry it for fuel, and some of them build furnaces to burn it out of the way—some of them try to burn it in piles, and others haul it to the river, the study is how to get rid of it the easiest way. In an unrotted condition it would be deleterious to land if hauled upon it, and of course worse than worthless.

The most profitable use that can be made of bagasse upon the Illinois prairies would be as fuel to boil the juice. But for that it requires considerable labor and expense for handling, drying and storing. Bagasse is, on the whole, a nuisance that most cane growers would be glad to get rid of if they could without expense. If any neighbor thinks it of sufficient value to pay for hauling away from the mill as fast as it accumulates, let him have it and thank him for the favor.

Cornstalk Fodder.

This question was again agitated by a letter from Mr. Peter Planks, Mechanicsburg, Cumberland county, Pa., who is much in favor of chopping the stalks, and thinks that when thus treated they are good feed, and will go twice as far as fed whole, and thus pay well for the time. The cows keep fat upon the cut stalks, wet and mixed with meal.

The Chairman said that in his experiments in feeding cornstalks he had found the but-ends more valuable than the tops. His plan is to give the stalks to the cattle as they grow, and let them eat what they will, and then gather the refuse and pass it through a cutting machine.

Mr. John G. Bergen and Dr. Trimble both disputed this point, as to the value of but-stalks, considering them of very little account, except so far as some coarse feed is necessary to distend the stomach of animals.

Mr. Wm. J. Townsend, said his custom was to feed the top stalks to milch cows, and the buts to other stock, which were thus kept in good condition. He grows corn on purpose to produce this kind of feed.

Mr. R. A. Van Winkle writes from Arrington, Atchison county, Kansas, that in his opinion "one of the causes of mad itch in cattle is feeding them on the buts of cornstalks—that the hard, woody fiber of the stalks clogs and fills up the manifolds, and produces the disease known as mad itch. Sorgo stalks are equally bad, and both corn and sorgo, whether fed green or dry, are injurious, and rather the most so when eaten green. Some farmers cut up corn when nearly ripe, and feed it to their hogs. It is often done in the west, and is very good for the hogs, but if you let cattle get what they leave they frequently eat it after the hog has sucked all the nutritious substance from it. This substitute will produce mad itch in cattle sooner than anything else.

Mr. Wm. J. Townsend insisted that he had had many years' experience in feeding cornstalks, and had never known them to produce disease. His experience has been the same in feeding sorgo.

Mr. Wm. S. Carpenter said that he had known bad results produced upon cows fed with cornstalks just before calving; he had lost one, as he believed, from that cause. The effect seems to be an inability of the cow to get rid of the afterbirth.

Mr. W. J. Townsend said cows in that condition should never be kept upon dry feed of any kind. He had lost them in similar circumstances when fed upon hay.

Mr. Wm. C. Hastings.—Experience as regards cornstalks induces him to come to the same conclusion as Mr. Townsend. He thinks they may be heating and injurious to cows near the time of parturition. But that may be remedied by bran mashes. As to the leaf or stalk being more nutritious, he thinks the leaf is, from the fact that when a stalk is thrown to an animal it will always eat the leaves first, should that not satisfy the appetite it will then eat the stalk, as it is necessary for any ruminating animal to take into its first stomach a certain quantity of woody fiber to enable it to ruminate. He has seen cows fed on cut corn stalks, and some feed better beef than cattle he saw driven to be slaughtered.

Mr. Bergen said: I have no faith that the buts of corn stalks are valuable for food. I know that the tops and the leaves are. Formerly it was the practice on Long Island to top the corn after it began to ripen. These stalks, well cured, were the most valuable feed we could obtain for cattle or horses. Both kept fat upon them, rejecting only a small part of the hardest portion.

HEDGES.

Mr. W. J. Townsend gave his experience with hedges, and earnestly advocated the white English hawthorn. He has a hedge of this kind upon his farm near Skaneateles, which is over forty years old, and is a perfect fence against all kinds of farm stock. He keeps it trimmed to about four feet high, except where it is used as a screen along an orchard, it grows twelve feet high. Trees that are grown singly in the field, often attain a hight of 25 feet, and produce a peck of seed, which, if carefully treated, will afford from 10,000 to 12,000 plants. To get the seed ready for planting in the spring, it is mixed with sand where it will freeze and thaw during the winter, or kept moist in barrels in the cellar, where the pulp rots, and can be easily washed from the seed. Great care is necessary in planting to keep the birds and chickens from the seed-bed, and frost from the young plants which are very tender. In his section this thorn is not subject to blight to any great extent, and is easily cured by sprinkling with powdered lime. Blight sometimes destroys pink hawthorn hedges, and that is perhaps one of the causes of prejudice against them. A good many farmers in my section are planting new hedges. The plant is set at one year old, cutting the tops off near the ground, fifty plants to a rod in a single row, the ground being prepared as it would be for a corn crop. The next season the plants are cut one inch above the first cut, and afterward they must be kept properly trimmed every year to make a good hedge.

Mr. W. S. Carpenter said that one of the best hedges he had ever seen was made of honey locust, which Mr. Townsend objects to because it is so difficult to keep trimmed in proper shape.

Mr. Aycrigg, of Passaic, N. J., stated that about seven years since he set out a hedge of Norway spruce, in a single row, two feet apart, and kept them down, and by degrees allowed them to gain their present height of about four and a half feet. They have been severely clipped without injury. The appearance is beautiful, but it will require several years more before the stems and interlacing branches will be strong enough to turn cattle, and until then, they must be protected by a fence, on the road side. He objected to hedges of thorn or honey locust on public roads, as dangerous to travelers in dark nights.

List of Fruits for the Vicinity of New York.

Dr. Trimble called up this question, and moved that the Club adopt the following list, which it recommended several years since:

Summer Apples.—Early Bough, Early Harvest, American Summer Pearmain, Summer Rose.

Autumn.—Autumn Bough, Gravenstein, Hawley, Fall Pippin, Porter, Jersey Sweeting.

Winter.—Baldwin, Rhode Island Greening, Jonathan, Monmouth Pippin, Spitzenberg (Esopus), Tallman Sweeting, King of Tompkins County, Boston Russet.

Summer Pears.—Doyenné d' Eté, Dearborn's Seedling, Beurré Giffard, Rostiezer, Tyson.

Autumn.—Bartlett, Seckel, Buerré d'Anjou, Buerré Superfin, Doyenné Boussock, Duchesse d'Angoulême (on Quince), Flemish Beauty, Fondante d'Automne, Sheldon, Urbaniste.

Winter.—Beurré Gris d'Hiver Nouveau, Beurré Diel, Lawrence, Vicar of Winkfield.

Cherries.—Belle de Choisey, Bigarreau, or Yellow Spanish, Black Eagle, Downer's Late Red, Early Purple Guigne, Elton, Black Tartarian, Governor Wood.

Plums.—Green Gage, Coe's Golden Drop, Imperial Gage, Washington or Bolmar, Smith's Orleans, Jefferson.

Peaches.—Crawford's Early, Crawford's Late, Early York (Large), Bergen's Yellow, George IV., Oldmixon Free, Morris White.

Clings.—Heath, Large White, Oldmixon.

Nectarines.—Downton, Stanwick, Early Newington.

Apricots.—Dubois' Golden (American variety), Peach or Moorpark.

Grapes.—Delaware, Diana, Concord, Union Village, Hartford Prolific.

Quinces.—Orange, Rae's Seedling, Portugal.

Currants.—Large Red Dutch, La Versaillaise, Victoria, Large White Province, White Dutch, Black Naples.

Gooseberries.—Downing's Seedling, Houghton's Seedling (hardy American varieties, and free from mildew).

Raspberries.—Hornet, Franconia, Orange, Belle de Fontenay.

Strawberries.—Triomphe de Gand, Bartlett, Wilson's Seedling (acid) Hooker's Seedling (sweet), Jenny Lind.

Blackberries.—New Rochelle (or Lawton), Dorchester, Newman's Thornless.

To this there were some strenuous objections. Mr. Bergen objected to the names of the Summer Apples, for their indefiniteness. Who knows, said he, by the Summer Rose and Early Bough, what they are? Then of Early Harvest, there is one yellow and one red. Finally, he contended "that no list could be made to suit the locality of New York, because upon one side of the city, in Westchester county, the Strawberry Apple is one of the best early varieties. On Long Island, it is so worthless we are cutting down the trees. The Summer Pearmain, which is an excellent apple in some places, is not at all adapted to this locality. Several kinds that are said to do well in Westchester county, will not do at all on Long Island. Dr. Trimble says that it is very important that new beginners should have a carefully prepared list, with only a few sorts, which they would be sure would give satisfaction if recommended by such a body as the Farmers' Club. Grant all that, how can we recommend such a list when we know that all these sorts will not do well in every place within a small circuit aronnd this city."

Mr. Wm. S. Carpenter said: I would certainly reject Summer Pearmain, and I would head the list of summer apples with that most delicious and best of all, the Primate. I would place Early Joe next. It always does well, and ripens next after the Sweet Bough, which is a universal favorite. The Jersey Sweeting should be placed upon the list of summer apples instead of the autumn.

Mr. Solon Robinson inquired if there was any one fruit which could be recommended as suited to all localities.

Mr. John G. Bergen replied that the Bartlett pear was the only one.

Mr. W. S. Carpenter said it is very singular, but true, that some varieties of pears which grow finely upon his farm, were worthless upon his neighbors', and other sorts which his neighbors produce have never succeeded with him.

Mr. John G. Bergen, said this proves that no perfect list can be made for any place. The person who is ordering trees must exercise some judgment of his own, as to what will suit his own particular case. He also criticised, with some severity, the committee who made up this list, as not being practical fruit-growers.

The Wilson Strawberry.

Mr. Plank, Mechanicsburg, Pa., says it will not run out after producing one or two crops, if kept well trimmed of runners. "I plant in rows three feet apart, plants fifteen inches in the row. Cultivate with hoes; break off runners as they appear; careful not to injure the plants in the least. Treated carefully in this way, will produce three full crops at least. I will mention that my ground is not subsoiled nor trenched; neither is it highly manured."

Grapes that Do Well in Eastern Pennsylvania.

Mr. Plank says: "In the spring of 1861, I sat out Catawba, Isabella, Concord, Diana, Delaware, Clinton, Rebecca, Hartford Prolific, and several other inferior varieties. Vines all one year old; all fruited last season; all ripened well excepting Diana, but none compared in beauty and productiveness to those old standards, the Isabella and Catawba—the Catawba best of all."

Grapes.

The following list of grapes were recommended in the proportion of the figures to each name: Concord, 15; Delaware, 10; Hartford Prolific, 5; Diana, 5; Catawba, 5; Crevelling, 3; Maxatawny, 3; Allen's Hybrid, 3; Clinton, 2; Isabella, 2; Union Village, 1; Alvey, 1; and the new grape called Iona, 2, and after it is sufficiently propagated to reduce prices, it is probable the proportionate number would be greatly increased.

Michigan Marshes—What Shall be Done with Them?

An owner of marsh land writes from Webster, Mich., for some information as to what those who are similarly situated shall do with such land. He says:

"There are to-day millions of acres of just such land in this State that needs to have something done to it; and the man who can furnish us with a method whereby these lands can be reclaimed and made to produce good timothy or red-top, and which will not cost more than the price of land around it (from $15 to $25 per acre), deserves the warmest gratitude from all who may live on or near a Michigan marsh. These marshes are part and parcel of our farms, and we desire to see them producing something different from their natural grass. Many farmers who have creek marshes with a clay or gravel subsoil have brought them into tame grass by ditching. But what can be done with marshy or springy bottoms, or where the marsh muck is from three to five feet deep, is the question. Some have tried ditching and draging without any perceptible results. Tame grass either dries out altogether, or becomes dwarfed, and is scarce worth the harvesting. Now, then, if any of you have ever possessed any such land, and made it a fit place for the growth of anything else than snakes, toads, and the everlasting sickel grass, please give three thousand wolverine farmers the benefit of your experience."

VENTILATION, COOKING, AND FARMERS' FOOD AND HEALTH.

Mrs. C. J. Pennoyer, of Sharon Station, says:

"I was reared in a farm-house where there was everything to make life comfortable, with fire-places in all the rooms, and an abundance of wood, too. Yet it was sometimes too cold; but now, with stoves, we need ventilation. In the kitchen we can always open doors; and, if need be, a window, too, and yet be much more comfortable than with the old fire-place. The superior advantages of the improved cook-stove over the old-fashioned fire-place for cooking I think no one will deny. No woman who has ever cooked over a fire-place could be prevailed on to leave her stove, yet I do not believe that 'low ceilings and want of ventilation' are the cause of 'pale faces' as much as the 'food question.' No class of people can live as well as the farmer. He can raise the most he wants to eat. He can have good grain, fresh vegetables, an abundance of fruit, if he is a true man; and he can go to his flocks and herds and poultry yards, and have meat that he knows is not diseased; and that is more than can be said of those who do not raise their own food. The more simple the food and plain the cooking, if well done, the better; and, in my opinion, much of the ill health and pale faces in farmers' families come of the present modes of cooking, which are sought out in modern 'cook-books,' and by which dishes are formed that would sicken any but a gormand, such are their vile compounds, and so unlike the plain food formerly in use in farmers' families, when there was no better ventilation, and very few pale faces. I think the human stomach is something like conscience—the more you sin against it, the harder it becomes. How often you hear the remark, if you object to certain kinds of food, 'It does not hurt me.' The healthiness of pork for food is not sufficiently discussed. Is it wholesome? We think not, and no pig-pen has been found on our premises for twenty-five years, and no part of the animal has entered into our bill of fare."

CHEESE-MAKING.

Mr. Wm. H. Brimmer, Stephentown, Rensselaer county, N. Y., wants the Club to discuss cheese-making.

Mr. Solon Robinson—Mr. Brimmer forgets that New York City is a cheese-eating and not a cheese-making locality, and that persons competent to give instruction are seldom in attendance from the country. We append a paragraph from his letter:

"Some old people think you must kill the calf on a full stomach, and save the curd; but by this method you are sure to have a disagreeable taste, which is commonly called rennety cheese. I have made cheese from fourteen cows, and only used nine rennets in the whole season, making 4,000 pounds of cheese, beside what we used in our own family My method is, let the calf stand from fifteen to eighteen hours after he has been with the cow before he is killed; turn out anything that may be in the rennet, and pack in salt; let it remain there until wanted for use, then soak in water, and keep salt in the bottom of the jar continually, and stir every morning."

Planting Forest Trees upon the Prairies.

Mr. L. P. Noyes, Springville, Iowa.—I have found nothing that will compare with white or soft maple, that grows on most of the large streams and low lands in the north western States, for vigorous growth, and as a beautiful tree, it has no equal. I have trees that are six years old the 20th of June, next, that are six inches through, and from sixteen to twenty feet high. The seed ripens from the tenth to twentieth of June. The ground should be prepared as you would for corn; the seed should be planted as soon as convenient after picking from the tree, and should not be exposed to the sun long, before planting. Mark your ground five feet apart, and plant in drills six inches apart, and cover the seed from half an inch to one inch deep, with well pulverized earth. I should recommend a location that was a little shaded by trees, as the rays of the sun is apt to injure them for the first few days after they come up. I have transplanted thousands, and have never known one to die if properly cared for. The value of the timber for fire wood, rails, and mechanical purposes, has no equal.

Adjourned. John W. Chambers, *Secretary.*

March 29, 1864.

Mr. Nathan C. Ely in the chair.

Transplanting Fruit Trees.

Mr. Geo. Bartlett.—I adopt the following method of planting fruit trees: I dig the hole rather large, and place the tree in the centre. I then pour in two pails of water and shake the earth in; by this means the tree is firmly fixed, and the earth is in close contact with the roots of the tree. By this method a person can walk around the tree and set it perfectly perpendicular. I had a hogshead prepared so that it could be placed upon a wagon, and with a faucet with a small piece of hose, the requisite quantity of water is applied to the hole.

Mr. Wm. S. Carpenter asked if Mr. Bartlett planted all kinds of trees in this way.

M. Bartlett.—I do. From long experience my trees have grown well after being planted in the way described.

Mr. Wm. R. Prince.—I would recommend that the fine earth should be placed in the hole first, and then the water poured in, to cause the earth to settle well among and around the roots.

Mr. Wm. S. Carpenter.—Great care is necessary to plant a tree properly; the hole should be dug large, the roots should be properly pruned and shortened, then the young rootlets will start and become quite numerous. By this means the tree grows very rapidly. The next year the shoots should be shortened at least two-thirds of their length.

Water Melons.

Mr. Martin E. Thompson.—Some remarks were made at a previous meeting in relation to magnesian soils as being very superior for water melons. I have seen water melons grown by Dr. Hosack that weighed forty or fifty pounds each.

Dr. Trimble.—Water melons can be raised on drift sand. I have seen them grow on sand screenings as large and as fine as I have seen grown any where.

Mr. John G. Bergen.—Long Island was once famous for producing the best melons; but of late years we are not able to raise any. It may be that the magnesia has been all exhausted from the soil; after we manure and fertilize our soils, the melon does not seem to grow in such perfection; therefore the remarks of Dr. Trimble verify my opinion that the soil of Monmouth county, N. J., is so poor that melons can be raised.

Mr. Wm. S. Carpenter.—I have a piece of ground, the soil of which is part clay and part sand. I grow melons on it, the finest I have ever seen, by adopting the following plan: All over this piece of ground I dig large holes, which I fill with manure and cover over with about six inches of soil; on this I plant melons and raise some of the finest seen in our markets. The next year this well-rotted manure is removed to other parts of the ground, and the holes again filled with manure, and covered with earth as before. I have grown melons on this piece of ground for the last ten years.

Mr. W. J. Townsend.—We cannot grow melons in Onondaga county. I have tried the plan recommended by Mr. Carpenter, but still our melons are small.

POTATO ROT.

Mr. W. J. Townsend.—Previous to leaving home I was engaged in taking the statistics of my school district. There was a great complaint in relation to the potato rot in our section. We have discarded the Mercer potato entirely.

Dr. S. J. Parker.—I had hoped while in the city to have had a full discussion with the members of the Club on the best way of making wine out of American grapes. This is an important subject, and one in which the experience of wine makers ought before long to lead us to some practical results.

The best wine I ever made I made last fall, and that was by an analysis of each kind of grape juice. This readily assumes a shape sufficiently accurate to allow certain instruments to determine what is to be done, and they can be used by any one. The best rule, in a word, is to have the grape juice for sugar stand at sixteen degrees of Beaumé's hydrometer, for liquids heavier than water. The acid at five pounds in one thousand pounds of juice. The flavor cannot be improved only by ripeness or adulteration.

By this rule Catawba has, even when not fully ripe, ample flavor, and makes a choice wine.

Rogers Hybrid, No. 1, the white grape, makes a good champagne wine, remarkably rich. If always as good as my sample, then no grape in America equals it, both for sparkling and still champagne; and as soon as the public know the fact no one can supply the demand for it. For vineyards, Rogers No. 15 also makes a very fine, dry wine; and his Nos. 4, 3 and 19 are wines with a peculiar delicate bouquet and fancy flavors.

But the subject is too long a one for a brief discussion, and that is a fault I have with the Club. There is not time or patience with a long subject that requires time, thought and deliberative discussion.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

April 5, 1864.

Mr. Nathan C. Ely in the chair.

PLASTER.

Mr. Wm. S. Carpenter.—There are two kinds of plaster used in this country. One is the common white plaster or gypsum; the other is from the western part of this State. It is of a blue color, said to be of great value as a fertilizer. As Prof. Mapes is present, I should like to hear his opinion of its qualities.

Prof. Mapes stated that the sulphate of lime was isomeric with plaster of Paris, sometimes called gypsum. Formerly the entire supply was dug from the basin of Paris, and the caves left by its removal were now used for the growing of mushrooms. The chief supply of plaster of Paris for this country is from Nova Scotia, the purer whiter portions being reburnt and used for casts, wall facings, &c.; the less pure portions are ground and sold for agricultural purposes. There are many localities from where plaster of Paris can be obtained differing in purity. These from the western part of the State of New York contain an admixture of sulphuret of lime, emitting an odor, when struck with a hammer, resembling that of the fetid lime stone of Niagara, which resolves itself into a water cement when burned; indeed, all hydraulic cements are made from fetid limestone.

Sulphate of lime (plaster of Paris) is composed, as its name indicates, of sulphuric acid and lime, and these ingredients are not separated from each other, even at a high heat.

Soils which are deficient of sulphuric acid or lime are materially benefited by the use of finely ground plaster, top dressed, at the rate of one to three bushels per acre, larger quantities being quite unnecessary. Lands refusing to produce clover are materially benefited by the use of plaster.

The ashes of many plants contain it in notable quantities. It may be used with great advantage by dusting it over compost heaps from time to time. It acts as a deodorizer, and arrests over violent chemical action during the decomposition of dung heaps.

Stables may be kept sweet, in a degree, by dusting it over the floors, and thus finding its way to the compost heap charged with nauseous gases emitted from the surfaces of animals, &c.

It is sometimes used in the manufacture of poudrette. The turnip and other crops which are subjected to the attacks of the smaller insects, are oftentimes preserved by being slightly dusted with plaster of Paris.

Mr. Wm. S. Carpenter.—Does the plaster lose its value by being kept long after it is ground?

Prof. Mapes.—If you want the plaster as a fertilizer it does not, but if you want it as a deodorizer it does.

The ground on the side of the farm fences I now occupy was very foul with weeds; these I destroyed by the use of salt, which should be applied in the crystal form, thrown on the surface of the soil; half a dozen night dews will dissolve the whole, and the land was as clear as this floor, but the action of the salt will only last one season to render the soil barren.

The Chairman.—I would inquire if the Franconia raspberry is hardy in this locality?

Mr. Wm. S. Carpenter replied that like Brinckle's Orange, the improved Antwerp and others of that class, it was only semi-hardy, and requires protection in winter to render it a sure producer. The fruit is of the first class in size and quality of the soft or tender varieties, but that it would not stand the severe changes of winter, and was often winter killed by the low temperature.

Mr. R. H. Williams remarked that he understood Mr. E. Williams, of New Jersey, to say very emphatically that his attention had been directed to the subject of the winter killing of the raspberry for several years, and his experience had confirmed him in the opinion that the raspberry was very rarely if ever killed by the low temperature of the winter, but from spring freezing after the sap had commenced to flow, and recommended as a preventive such a surface covering in late autumn as would act as a non-conductor, and thus delay the tendency to early budding in these tender varieties, viz: coarse straw, manure, sawdust, &c.; and he would add in confirmation of this theory, his own experiments in Western New York, and called attention to the subject for the purpose of eliciting further investigation and observation on the part of those who were engaged in the cultivation of this class of semi-hardy fruits.

Mr. Wm. S. Carpenter thought that the theory would not hold good, as all of the varieties started about the same time in the spring, hence all should be killed.

Mr. R. H. Williams replied that the only tendency to show vitality in a plant or tree was not always an evidence of inability to resist the climate; as, for instance, the willows, which are among the earliest of the native trees to put forth buds, flowers, and leaf in the spring, are rarely killed, while certain varieties of the raspberry from a more delicate structure of both wood and bark might suffer severely, when trees in flow of sap from a temperature that would not injure the cane in a torpid state.

Mr. Wm. S. Carpenter.—I think the change takes place during winter. I have discarded nearly all varieties of raspberries that are not hardy.

I have a number of hardy Rhododendrons, and to make a variety I imported a number from England. These I found necessary to cover, which I do by throwing pine branches around them for the purpose of keeping off the sudden changes. This spring I found a number of the imported varieties dead.

Mr. R. H. Williams.—Are these hardy plants killed by the early movement of the sap, or are the trees or plants frozen to death? My idea is that the sap begins to rise, and then a sudden frost will naturally destroy the plant.

Soil and Situation of an Orchard.

Mr. Wm. S. Carpenter.—Soil capable of producing a good crop of corn may be considered suitable for an orchard of either apples or pears. The situation of an orchard is of but little consequence, if the exposure to high and raking winds have been avoided.

Preparation of Trees for Planting.

When trees are removed from the nursery, no matter how carefully it may have been done, the roots will be mutilated in the digging. Therefore, before planting, all injured roots should be cut off smooth with a sharp knife. A tree six feet high should have its roots shortened into the diameter of two feet. Trees which vary in height from six to eight feet should be pruned so as to remove sufficient wood, as to compensate for the loss of roots, which is done by removing from the tree two-thirds of the previous season's growth, and some of the branches can be cut out entirely to give to the top its proper shape.

The tree being ready for planting as directed, and presuming that the soil is in good condition, a hole should be dug sufficiently deep and wide to receive the roots without their being cramped. Two persons are required to plant a tree properly—one to hold it upright, and the other to spread out the roots and put the soil with the hands around the roots, filling up every space. The soil should be pressed firmly about the tree to prevent its being shaken about by the wind. Care should be taken and not plant too deep—never setting the tree deeper than it stood in the nursery. Mulching with litter from the barnyard over the roots of the newly-planted tree is useful; frequent working of the soil by the hoe or cultivator in summer has a similar effect during the growing season. It is sad to witness so much neglect in the orchard; and without more attention than is given by farmers to their fruit trees no satisfactory results can follow. The careless and slovenly treatment of the orchard is the true cause of so much loss and disappointment.

Varieties of Apples to Plant.

I have thought best to propose two lists of fruit—one for the amateur and another for market purposes. Some of our finest fruit cannot be marketed to advantage, but are indispensable to the amateur.

The following is a list for the amateur or home use. I place the varieties in their order of excellence, so that if the list is too long for any it may be decreased, and the best selection secured by taking from the top of the list:

Apples—Summer Varieties.

PRIMATE.

Large; yellowish white, with a crimson blush; one of the finest dessert apples in cultivation; time of ripening August to October.

SWEET BOUGH.

Large; yellow; flesh tender; crisp and sweet—August.

EARLY JOE.

Medium size; yellowish, and striped with red; very tender and juicy, with a fine flavor; very productive—August and September.

JULIEN.

Fruit medium; yellowish-white, striped and marked with carmine; one of the finest summer apples known—August.

AUTUMN VARIETIES.

GRAVENSTEIN.

Large ; yellow, striped with crimson ; tender, crisp, and high-flavored ; one of the finest apples grown ; the tree is very vigorous and productive—September and October.

PORTER.

Large ; bright-yellow, and of very fine quality ; the tree is very thrifty, and a good bearer.

JEFFRIES.

Medium ; yellow-shaded, and splashed with crimson ; flesh tender, juicy, with a rich, mild sub-acid flavor—September.

JERSEY SWEETING.

A very popular sweet apple, both for cooking and for the dessert ; size medium ; greenish-yellow, striped with pale, dull red—Sept. to Oct.

WINTER VARIETIES.

MOTHER.

Fruit medium, skin nearly covered with deep red, flesh juicy, crisp, tender, with a very rich, aromatic flavor ; November to January.

HUBBARDSTON NONSUCH.

Large, striped and splashed with hale and bright red; flesh juicy, tender, with a most agreeable flavor.

PECK'S PLEASANT.

Large, yellow, with a blush on the sunny side; fine grained, juicy, crisp, tender, with a delicious, high aromatic flavor; November to March.

DUTCH MIGNONNE.

Very large, skin covered with a rich, dull red; flesh tender, with a rich, aromatic flavor; November to February.

JONATHAN.

Medium, nearly covered with crimson; flesh tender, juicy, with a very pleasant flavor; November to March.

RHODE ISLAND GREENING.

Large, green, flesh juicy, tender, and of an agreeable flavor; a great bearer.

LADIES' SWEETING.

Large, yellowish, nearly covered with red; flesh exceedingly tender, juicy, and crisp, with a delicious, perfumed flavor; February to May.

TOLMAN'S SWEETING.

Medium, yellow, juicy, crisp, with a sweet, aromatic flavor; December to April.

KING OF TOMPKINS COUNTY.

Large, skin yellow, mostly shaded with red; flesh coarse, juicy, tender, with an agreeable vinous flavor; December to March.

APPLES FOR MARKET—SUMMER VARIETIES.

Primate, Sweet Bough, Summer Queen, Summer Pippin, Red Astrachan.

AUTUMN VARIETIES.

Porter, Drap d'Or, Gravenstein, Hawthornden.

WINTER VARIETIES.

Rhode Island Greening, Baldwin, English Russet, Smith's Cedar, Hubbardston Nonesuch, Monmouth Pippin, Peck's Pleasant, King of Tompkins County, Tolman's Sweeting.

LIST OF PEARS FOR HOME USE.

DOYENNE D'ETE.

Small, clear yellow, with red cheek; a very fine, juicy, sweet pear; July.

MANNING'S ELIZABETH.

A beautiful dessert fruit, below medium, skin bright yellow, with a lively red cheek; flesh juicy, and very melting; sprightly perfumed flavor; August.

OTT.

Small to medium, greenish yellow, reddish on the sunny side; melting, rich and aromatic, very productive; end of August.

ROSTIEZER.

Medium, dull green, with brownish cheek; juicy, buttery and perfumed; end of August.

AUTUMN VARIETIES.

BARTLETT.

Large, bright yellow, juicy, buttery, aromatic, inclining to muskiness; September.

FLEMISH BEAUTY.

Very large, yellowish, inclining to russet; juicy, melting, rich and fine; Last of September.

SHELDON.

Medium to large, greenish russet, with a shaded cheek; melting, juicy, with a spicy flavor; October.

SECKEL.

Small, dull yellow russet, with a colored cheek; buttery, very juicy, with a rich, spicy flavor; September and October.

FONDANTE D'AUTOMNE.

Rather large, yellowish green, very delicious and rich; September and October.

BEURRE BOSC.

Large, yellowish russet, very buttery, delicious and perfumed; October.

BEURRE D'ANJOU.

Large, greenish yellow, shaded with dull red; rich, melting, fine vinous flavor; October and November.

BEURRE HARDY.

Large, yellowish russet, melting, with a highly perfumed vinous flavor.

DUCHESSE DE BERRI D'ETE.

Medium, yellow, shaded with red; a fine flavored pear; first of September.

COITS BEURRE.

Medium, cinnamon russet, with crimson on the sunny side, buttery, melting, sugary, with a first rate flavor—September.

WILMINGTON.

Medium; skin cinnamon russet, flesh fine, melting and buttery, rich and sacharine; a delicious pear; one of the best—September.

HENKEL.

Medium to large; lemon yellow, melting, juicy, flavor sprightly, vinous, perfumed and excellent—October.

CHURCH.

Medium; yellow, juicy, sweet and excellent—September.

PARADISE D' AUTOMNE.

Large; common russet; one of the best in cultivation—October.

DUCHESSE D' ANGOULEME.

Very large; a good table pear—October.

WINTER VARIETIES.

LAWRENCE.

Large; yellow, buttery, rich and delicious—December and January.

DOYENNE D' ALENCON.

Medium; yellowish, shaded with dull crimson, buttery, juicy, sugary and very rich—December to April.

WINTER NELIS.

Medium; yellowish green russet, fine grained, melting, very rich and delicious—December to January.

BEURRE DIEL.

Very large; dull yellow, with russet, rich, sugary and delicious—Dec.

LIST OF MARKET PEARS.—SUMMER VARIETIES.

Sterling, Tyson, Doyenné d'Eté.

AUTUMN VARIETIES.

Bartlett, Sheldon, Flemish Beauty, Seckel, Belle Lucrative, Buerré d' Anjou, Louise Bonne de Jersey, Beurré Clairgeau, Beurré Superfin, Beurré Bosc, Fulton, Henkel, Duchesse d'Angouléme.

WINTER VARIETIES.

Lawrence, Winter Nelis, Doyenné d'Alencon, Vicar of Winkfield.

I feel a very deep interest in this subject, and take great delight in cultivating new varieties. Last year I visited the grounds of Mr. Charles Downing, at Newburgh, who has, I think, one thousand varieties of apples and about the same quantity of pears in cultivation. I am but a beginner; I have only about five hundred varieties of apples and pears.

This spring I am putting in about two hundred varieties of new fruit. At one time I came to the conclusion not to increase the varieties of fruit I had; but I find choice varieties are constantly being introduced so that I am obliged to extend my list.

Mr. R. H. Williams.—I hope this list will go out as the result of our investigations; let others go on and improve it.

The Chairman.—I have on my place an apple called the Golden Sweet; a very fragrant apple; it ripens in July. This apple originated in Connecticut.

Mr. Wm. S. Carpenter.—Last season I visited a great many orchards in Connecticut, and had an opportunity of seeing many very superior varieties of fruits.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

April 12, 1864.

Mr. Nathan C. Ely in the chair.

EVER BEARING STRAWBERRY.

Mr. J. H. Garretson, Richland, Iowa.—I wish to call your attention to a strawberry which I think is a new variety. I can find no description of it in any of the publications.

Mr. Wm. S. Carpenter.—From Mr. Garretson's description, I should judge it is called the monthly Alpine. By propagating this variety by runners, the fruit is found to degenerate; and the mode by which the fruit is kept the regular size is by planting the seed. The seed of this variety produces the same kind of fruit as the plant from which the seed is taken. The berry of the Alpine is very small, and in this age of large berries, strawberry growers have discarded this variety. I have in my collection a new strawberry, from Australia, a monthly variety, which promises well.

Mr. Geo. Bartlett.—There is no doubt several varieties of wild strawberries that bear monthly. In California there are varieties that bear for several months, in fact until winter.

CHURNING CREAM.

Mr. Wm. H. Cutler, Panama, N. Y., asks if there is any profit in churning the cream of farrow cows milk, when it is mixed with the cream of a new milch cow.

There is much dispute among dairymen on this point, we desire that you aid us in solving the problem.

The dispute is as follows: Some contend that the two different kinds of cream being mixed together produces a change in both, and when the churning is performed the butter will all come at the same time. Others contend that it takes from twenty minutes to one hour longer to produce butter from the cream of farrow cows' milk than it does from the cream of new milch cows' milk. It must follow that the cream of the farrow cows' milk is all lost in the butter milk.

Mr. John G. Bergen.—I have no facts to warrant the remarks I am about to make. If I understand the letter it means this: If you should take eleven twelfths of the cream of a farrow cow and one twelfth of cream of a new milch cow, we should only get the butter from the cream of the new milch cow, the other eleven twelfths would be lost in the butter milk. I do not believe it. I hope we shall have some light thrown on this subject.

Mr. Garretson.—I understand that a farrow cow is one that has passed the proper period of having a calf.

Dr. John B. Rich.—I have a favorite cow that did not have a calf at the usual period. She gives a large amount of milk. We keep this cow's milk separate, and churn it by itself. It makes a very rich butter. It takes no longer to get butter from this cow than from my others.

HEN MANURE.

Mr. John G. Bergen.—I use my hen manure and hog manure together, by making a compost. I consider hen manure an excellent article for nearly every crop, but it must be used very sparingly.

Mr. Wm. S. Carpenter.—I should advise that four barrels of hen manure be mixed with one barrel of plaster, and then this substance be well mixed with soil taken from the headlands of the fields. This manure can be used on corn with great advantage.

Dr. Trimble.—I should recommend that the hen, hog and barnyard manure be mixed with muck, then you will have a valuable compost.

Mr. Wm. S. Carpenter.—I hope we shall not let this mode of mixing manures go out as the opinion of this Club. Hog manure imparts a bad flavor to grapes. It is injurious to cabbages and carrots. Both hen and hog manurial are volatile, and require plaster to absorb and fix the ammonia.

TIME TO BUD CHERRIES.

The Chairman.—At what period do you bud cherries?

Mr. Garretson.—I bud cherries in April, May and June with great success.

GRAFTING OF FRUIT.

Mr. Alanson Nash.—The process of grafting is very well understood among a large class of persons, but after the graft is set it needs very great care and attention for at least four years if not more. The trouble lies at the joining of the graft with the old stock. If it is in the least exposed to wet the moisture runs and soaks into the split, and the old wood decays, and in the winter season the frost and the ice are sure to start out the graft, split open the wood, stop the circulation of the sap, and then the graft dies. The roots of the tree gather up the sap from millions of little rootlets, many times deep in the ground, and many rods away from the body of the tree. When plowing in an orchard I have known roots to be plowed up in the ground full seven, eight and even ten rods from the body of the tree; probably this was a peculiar state of things, though I have seen roots plowed up that extended near twenty rods from a rock maple. Where the roots run around, this is for the purpose of taking up the sap or liquid manure, which becomes, by a process of electrical and atmospherical action, the future wood and fruit and leaves of the tree, when it ascends during the following spring and summer. Every tree has a sap of its own, of a peculiar quality, as well as organs, which produce fruits even when ripe, either of an acid or sugary quality, dependent almost entirely on the seasons. Unripe fruit is generally acid, from the excess of oxygen and the want of soda; but one tree will produce sweet apples, another sour; so of grape vines, so of pear trees. Some fruit will ripen in June and July; other trees will ripen in August and September; others in October, November and December; some not till March and April. After we have done and said all, the composition of nearly all the fruits are potash, soda, some magnesia, and the four substances called carbon, oxygen, hydrogen and nitrogen, in their various combinations and modifications. Every tree produces fruit after its kind, unless grafted, and then the grafted fruit becomes modified, both by the stock and by the graft.

But all of these fruits depend very much upon the cultivation, and circumstances, and soil, and manure, and atmosphere, and seasons which surround the tree or plant producing its fruit. The apple originally was the size of a small cherry, now found wild, growing in the woods and forests in all the northern hemisphere, from the tropics almost to the pole. Indeed, the varieties of the apple are evidently artificial to a great degree. About the year 1770, in Hampshire county, Massachusetts, on the eastern slope of the Green mountains, a man by the name of Little, from Granby, Connecticut, came into the town, purchased a farm, then covered with timber of chestnut, oak and maple, resting on a granite and mica slate, and primitive formation. He started two or three nurseries of apple trees in different parts of the farm, and stocked his farm with a very large and fine orchard of choice fruit, which grew and flourished for near sixty years luxuriantly. In one of these nurseries, on land made of hard pan formation, on a swell falling to the west, north and east, many apple trees were left, and the land turned out to pasture. It so remained for a period of over eighty years. The cattle and sheep at once commenced browsing down the young trees, and have followed it to this day. The apple trees have now been reduced to three feet and less in height, while the body of the trees are from six inches to a foot in diameter at the ground. These trees bear no fruit, but from the ground upwards they are nothing but an impenetrable mat or nest of thorns, sticking out every way, literally at war with all the world, and all the world at war with the trees. There they remain, a standing monument of what nature, both animate and inanimate, will do to protect itself against its enemies. One of these trees, after it had stood nearly sixty years, warring with all the world, and then scarce three feet high, became enclosed in a mowing field—cattle and sheep, of course, were kept away from it. The tree immediately took advantage of its new condition. A sprout came up from the topmost centre, grew and formed a body of a tree, threw out branches, and has now become one of the elegant and most thrifty trees on the farm, producing a good growth of apples. Indeed, the dwarf trees now stand, many of them, less than three feet high within fifty feet of this new growth of one of their number. The dwarf trees entirely retain their beehive form, and are not much larger or higher than a good sized three-bushel basket. For more than sixty years the apple tree now producing fruit luxuriantly, remained and stood in the same condition that its sisters now do, showing neither fruit or flower. Its growth was devoured by the cattle and sheep of the farm every spring and summer.

We said that the roots take up the sap or liquid manure, which becomes the sap of the tree and ascends through the body of the plant, though the sap in its progress is changed from a watery fluid to albumen. This is retained awhile in the upper part of the tree, and becomes modified and thickened into wood, leaves and fruit; a portion still remaining, is again changed into a fluid, and then descends from the top towards the roots, depositing in its passage fruit and wood. It is the blood or life of the tree and plant. It is the sap which makes the wood and leaf, and which makes the fruit. It makes the wood and leaf where it circulates in abundance and with force. But the fruit is made only when the sap is checked in its flow. This is so whether the sap is checked naturally or artificially. We believe that the fruit is derived from the ammonial and mineral substances in the sap. The wood appears to come mostly from the carbonaceous ingredients of it. The wood is carbon, and fruit ammonia, in various forms and compounds. It is much so in the animal economy. But for ammonia, or the secretions of it in the organs of generation, the animal would never produce its young, and without ammonia the tree would never produce its flowers and fruit. The aroma of flowers and fruit is ammonial. Where the cultivator or gardener can govern the sap, he can produce wood or fruit in trees at his option. This is evidently the principle on which the honey bee will produce a queen when the old one is lost—that is, by feeding a young grub or bee in a peculiar manner.

The pruning of trees and grafting are subordinate to this principle. If we cut off the heads or bend down the trunks of the trees, or compress them against a wall or stake, we shall check the flow of the sap, the sap is delayed in its return passage, so that it produces flowers and fruit. By bending down a branch into a horizontal position, the bearing vessels are strangled to some extent at the point of curvature of the limb, at the same time the branch is withdrawn from the vertical position, which is favorable to the circulation of the sap; by bending down the branch or twig, there is a retardation of the sap in its developing process, and hence it works slower through the wood, and there is time for reproduction of fructification of the sap at the extremities or buds of the tree; when the leaf buds are cut off the flow of the sap is checked, and then one or more spurs are developed at or near the end which produces flower buds the next season. Grape vines produce large quantities only when they are kept in a horizontal position, and as near the ground as possible, or at least where the wood is trimmed off at the ends. Cut close a stock filled with shoots, and you will see the greater part of the shoots left changed into sterile branches instead of fruitful ones. By practising close trimming, the branches become disproportionate to the roots of the trees which supply sap, and then the tree runs to wood, the sap being no longer used up for the branches, it will turn aside to produce new branches and to form new wood, or perish under the bark for want of new issues, whereas if the branches are bent down from a vertical to a horizontal position, instead of cutting them off, the tree will be abundantly fruitful. If there is an impetuous sap, there will be little fruit, and it is not by cutting away largely the branches that the impetuosity of the sap is stopped, it is turned aside and nothing more. The best cultivator of fruit restricts himself to light trimming, and endeavors to moderate the circulation of the sap by heading down the boughs of the tree from a vertical to a horizontal position, the sap then moderates its flow, and fructification ensues ; where the soil is wet and moist the tree produces an abundance of sap, and runs to wood, which is not favorable to the production of fruit. The land wants draining. The tree should be set out on a dry and warm soil; on this there is less sap, and the tree will not run to wood so fast, but more to fruit.

We see now why trees that are grafted are better for fruit than the natural tree, the sap is obstructed in its descent from the extremities, and runs to fruit; so where one kind of fruit tree is grafted on the stock of another kind of tree, like the pear on the quince, and the apple or plum on the rock maple, the sap ascending is supplied in sufficient quantities to furnish a growth of the necessary wood, but without a redundancy, and when the sap returns by the vessels in its downward course, it is checked at the junction of the graft with the stock of the tree. The same law holds good with all vegetables—the gardener breaks down his onion tops to enable the bulb to grow and to find sufficient nourishment; and when potato vines grow rank, the tubers are small.

Fruit trees grown on the granite and primitive soils seldom carry so much sap as to run so largely to wood as not to produce fruit. Whenever the sap flows too freely, the wood increases in a disproportionate size, while little fruit appears. This is the case with grape vines which grow in a rich soil and are permitted to run on to trees without pruning—they are always barren to a great degree, of fruit, but lay down the vines into a horizontal position and prune off the growth of wood, and they are sure to bear. Vines taken from the forest and planted beside a stone heap in a pasture or mowing field, or confined to a horizontal position, will produce abundance of fruit, while a vine of the same kind running on to a tree, will exhibit but a meagre crop of fruit. Whenever grape vines or apple trees or orchards have been favorably located as to soil along the green stone ranges of the trap formation, they have always produced abundance of fruit. So with the apple, quince and the plum, when planted among the granite and mica slate and limestone formations. Whatever may be the soil, whether primitive, transition or secondary, the fruit grower will find that his orchards will not produce choice fruit unless he feeds the proper nourishment to his trees. Nature, among plants, as among animals, must be kindly treated and fed with congenial and wholesome food, and enough of it, and then she responds bountifully and with alacrity to the efforts of the cultivator.

There is no country which produces better and more abundant fruit orchards when cultivated, than these among the granite and mica slate hills. The materials of the soil for fruit among these primitive ridges, are most abundant. All that is needed, is to plant and set out the orchards in deep soil on the southerly and easterly side of the ranges of primitive rocks every where found on the hills and mountains. The grafting process works well, provided that the grafts are put in at the right season, and the stump or staff is properly protected. This should be done by covering the end of the boughs where the graft is inserted, with an abundance of grafting wax made of melted rosin, tallow and beeswax, and put on the end of the stock grafted; the whole of the stump should be covered with moss and tan-bark and surrounded with glazed or oiled cloth, so as to effectually exclude moisture and ice for the first four years, from the graft and the stump; the buds must come up through the moss, tan-bark and oiled cloth to the air, but not left so that the water will follow it down in rain during the winter and fall.

Fruits will partake of the soil on which the tree grows. I have known a peach tree which appeared to be dying with the yellows in the fore part of the season, revive by digging around the roots of it, and killing the borers or worms, then pouring soap suds around the roots twice a week during the balance of the season. On this application the tree revived, the leaves turned to a deep green, and in the fall the tree matured a heavy growth of fruit, being the Oldmixon or the St. Catherine cling stone. The peaches grew remarkably large, but the flavor of soap suds was tasted in every peach.

This economy of nature gives great power to the fruit-grower to improve the relish and flavor of his fruits. Chemistry and Science, to a very high degree, may be combined with the laws of Nature, and I know of no profession or employment which will be more benefited by a chemical and meteorological education than that of an agriculturist. A good farmer is a good chemist and a good philosopher, and he ought to know the whole economy of nature in its soils, climates, and seasons.

We have seen a thrifty peach orchard growing an abundance of fruit, while the surface of the ground was kept free from grass and weeds and stirred once or twice in the season with the hoe, but utterly destroyed for fruit by sowing grass-seed on the land followed with a crop of grass among the trees.

Indeed, grass, plants, and weeds cannot grow in an orchard, or among fruit trees of any kind, without most seriously diminishing both the quantity and quality of the fruit.

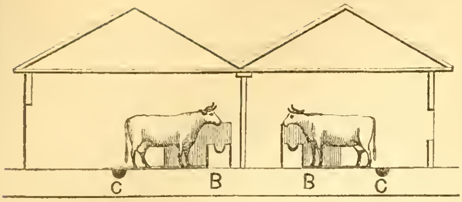
Liquid Manure.

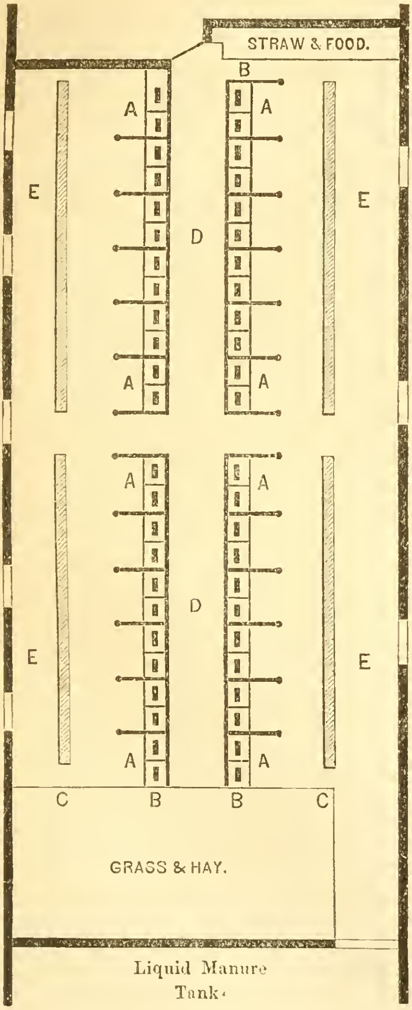
Mr. R. L. Pell.—I believe that next to the first principles of cultivation on the land, there is no subject of such vast importance to agricultural progress, as far as the increase of crops is concerned, as the efficient distribution of liquid manure. And from facts derived from late horticultural and agricultural experience, it is established that a degree of dilution, such as nearly extinguishes odor, is the best state for their application to plants ; that the delivery of the manure in a highly concentrated state, or its prolonged exposure, in a state of fermentation readily perceptible to the senses, is really wasteful ; while not only is the produce increased, but offensive emanations are entirely prevented by greater dilution with water, and more frequent applications of the liquid to plants. These conclusions were early corroborated by an able agriculturist, the late Mr. Oliver, of Lochend, who held a portion of the irrigated meadows near Edinburgh, and who complained that the sewer-water as there obtained was far too highly charged with manure for its best application, and that such tenants as himself were prevented from improving the system by the want of water for proper dilution, and of means necessary for more frequent applications of liquid manure. He was so convinced of the necessity of greater dilution, that he caused water to be pumped by steam for the purpose.

By the more rapid discharge of sewage from a town through closed tubular sewers, and by covering over the reservoirs for the storage of the sewer water, or rather by such extended arrangements for an increased frequency of the applications of the sewer-water to the land as would prevent the necessity of any extensive storage of such matter, the objections on sanitary grounds would be greatly diminished, and, in fact, considered trivial, if they were properly compared with the evils arising from defective drainage of the houses, and the consequent retention of decomposing refuse amidst them.

In the course of inquiries as to the means of street cleansing by jets of water, it has been ascertained that where pipes are laid down and water maintained in them at a pressure of about 145 feet, plugs being fixed at proper intervals, two men may water, by means of a flexible tube and jet, an extent of surface at the rate of twenty-two acres per day. How easy

FARM OF 40 ACRES.





This stable is intended for 48 cows. Behind the cattle there is a row of perforated plates, 18 inches wide, for the urine to pass through into semicircular channels to the tank, placed at the end of the barn.

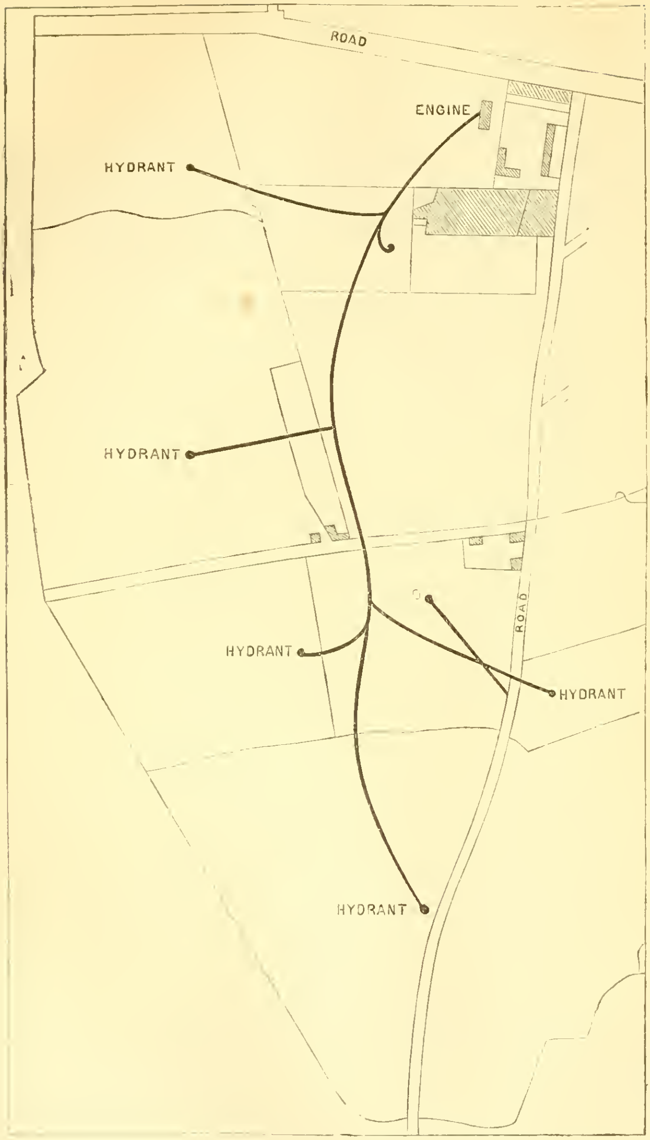
The following is the cost of the necessary arrangements for carrying out the liquid manuring system in such an establishment:

Tank	$160
Engine..................	310
Iron pipes and fixtures....	500
Distributing hose	100
	$1,070

Reference.

A, standing for 2 cows.
B, stone feeding troughs.
C, perforated plates with drain under,
D, centre aisle for feeding,
E, side aisle for milking and cleansing.

DIAGRAM OF A FARM CONTAINING 100 ACRES.

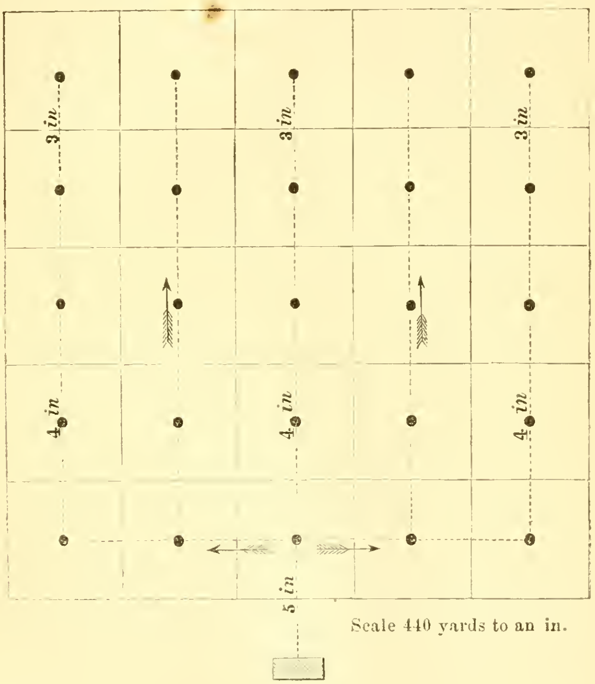


The above is the diagram of a farm containing 100 acres to be fertilized with liquid manure, carried through iron pipes with hydrants, hose and jet, every position to be reached by 200 yards of hose.

1,550 yards of 3 in. cast iron pipe, laying, jointing, &c	$880
7 hydrants and arranging	40
200 yards of hose 2 in. in diameter and spreader	75
	$995

PLAN OF A FARM CONTAINING 675 ACRES.

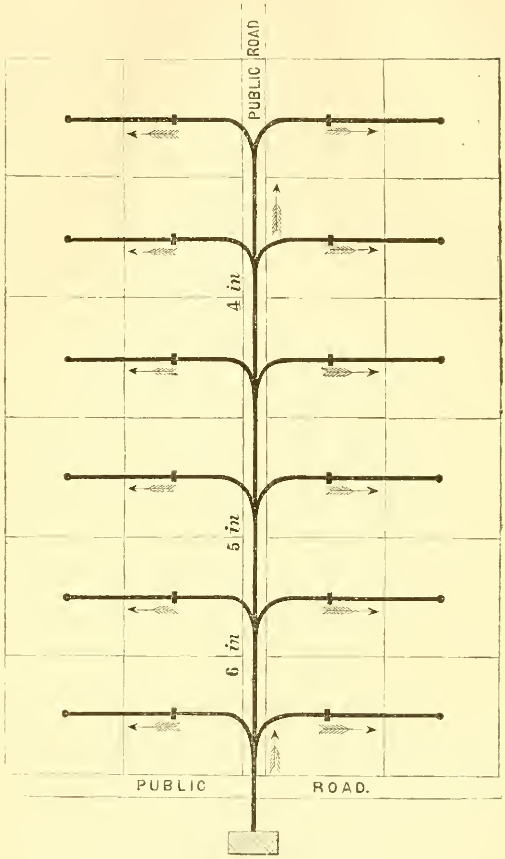
The following is the plan of a farm containing 675 acres, each square representing $22\frac{1}{2}$ acres, to be fertilized with liquid manure, conveyed through iron pipes, with hydrants, hose and jet, the most distant parts to be reached with 230 yards of hose:



Estimate for complete Distribution.

1,651 yards of five inch pipe, jointing and laying		$1,651
3,301 yards of four inch pipe,	do	2,476
4,952 yards of three inch pipe,	do	2,888
25 hydrants		125
230 yards of hose		87
Discharge pipe and spreader		6
		$7,233

DIAGRAM REPRESENTING 4 FARMS OF 240 ACRES EACH, FERTILIZED WITH LIQUID MANURE.



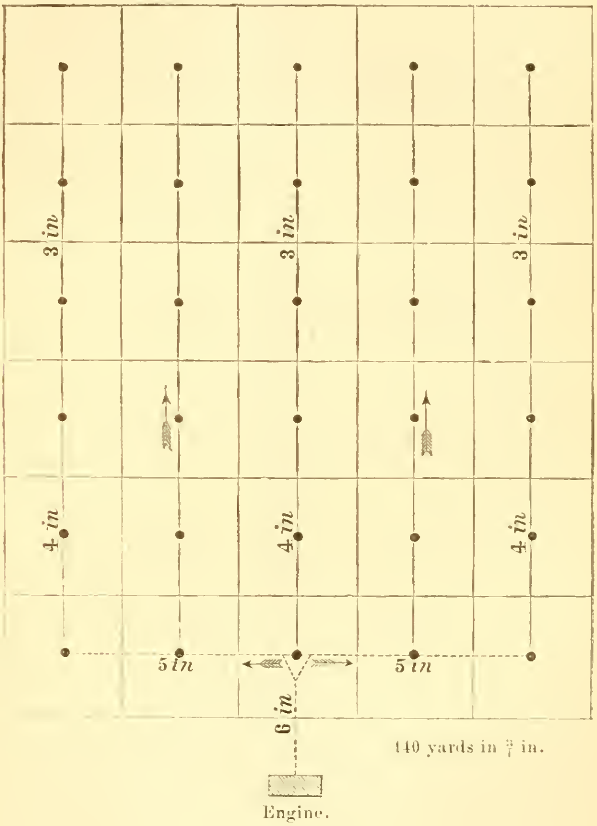
Steam Engine.

The projections on the lines indicate the positions of the hydrants. Estimate for iron pipeage, &c., for 4 farms of 240 acres each. The main pipe to be laid under a road 45 feet wide, and the most distant parts of the farms to be reached by 300 yards of hose.

710 yards of 6 in. cast iron pipe	and laying, &c		$880
881 yards of 5 in.	do	do	881
881 yards of 4 in.	do	do	662
8,220 yards of 3 in.	do	do	4,781
24 Hydrants			125
300 yards of hose			401
4 discharge pipes and spreaders			22
			$7,752

FARM OF 1000 ACRES.

Each square contains 40 acres, to be enriched with liquid manure, conveyed in iron pipes with hydrants, hose and jet, the most remote parts to be reached by 300 yards of hose.

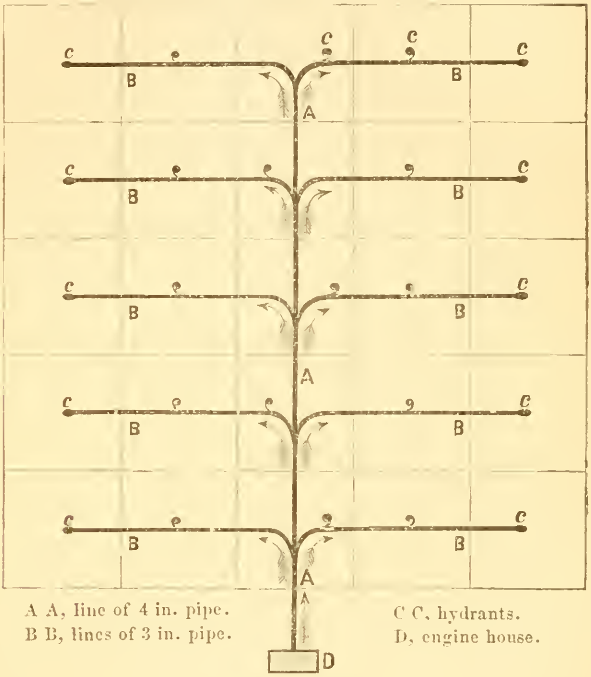


Estimate for Distribution.

442 yards of 6 in. cast iron pipe, jointing and laying			$560
1,760 yards of 5 in.	do	do	1,762
4,410 yards of 4 in.	do	do	3,310
4,410 yards of 3 in.	do	do	2,566
30 hydrants			150
600 yard of hose			210
2 discharge pipes			10
			$8.568

PLAN FOR A DISTRIBUTARY APPARATUS BY FIXED PIPES AND HYDRANTS.

Each subdivision represents a square of 10 acres; and the entire area consisting of 25 subdivisions, contains 250 acres.



A A, line of 4 in. pipe.
B B, lines of 3 in. pipe.
C C, hydrants.
D, engine house.

Estimate for Distribution.

1,100 4 in. cast iron pipes	$641
4,410 3 in. do	1,840
Laying and jointing	920
26 hydrants	130
	$3,531

Another estimate with Glazed Stoneware Pipeage with Cast Iron Collars.

1,100 4 in. stoneware pipes and collars	$410
4,410 3 in. do do	1,440
26 hydrants, $130; laying and jointing pipes, $685	815
	$2,665

would it be for every town in our country to have their sewer-water and town refuse collected in a reservoir by means of underground pipes, and from this pumped into a tank made at the top of any field commanding a portion of the contiguous country, from whence by means of hose two men might readily distribute nineteen hundred gallons of liquid manure in an hour, which would be sufficient to cover an acre of land. Villages situated on water courses might cause their night soil and other manures in a diluted state to be pumped into a boat worked by an eight or ten-horse power steam engine from which three hundred tons could readily be distributed per diem, at elevations of fifty feet or more above the river or stream through hose in lengths of three thousand feet, and its fertilizing power will always be found superior to the ordinary top-dressings with manure in the solid form. This process, for more economically distributing town manures, would, in many districts, render navigable rivers and canals the means of giving increased fertility to the land upon their banks, and thus, to some extent, counterbalance the diminution of their value as channels of inter-communication. And it will be found that after six tons of night-soil and urine, diluted with about forty tons of water, have been applied to an acre of land, in an hour no offensive smell will be perceptible. Most farmers may be aware of what would be the nuisance created for days, and sometimes even weeks, by the spreading of such a quantity of that manure undiluted upon the surface as a top-dressing; which quantity would, however, be insufficient to produce the effect desired, because, instead of its being absorbed by the soil and plants, much of it would be wasted in the air if the weather were hot, or washed into the ditches if it were wet. The parks in New York are occasionally top-dressed with street refuse, consisting chiefly of dung, which for a long time emits offensive smells, indicating the extent of escapes of gases, unpleasant to whoever may be exposed to them. Now, if the same quantity of matter, instead of being so applied in the solid form for top-dressing, had been put on in solution, or suspension in water, and applied in the liquid form to the surface of the parks, by means of water-carts, irrigation, or by any other mode, the comparative escape of miasma would have been small, and the emanations inconsiderable as compared with top-dressing.

When applied in the liquid form on a permeable and well underdrained soil at a temperature of about 70°, the emanations would not last above an hour, as it would only require that length of time to be absorbed productively by the land, as manure. This principle is applicable to the whole of the decomposing animal and vegetable refuse, nightsoil, or other matters, as well as stable manure. The top dressing put on our parks are expose to many casualties from exposure to the weather, such as almost entire loss of those important matters which constitute the food of plants. If there should happen to be a continuous fall of rain for several days, the most enriching portions of the manure would be washed from the surface into the adjoining water courses. If frost should come on suddenly, so as to lock up the ground, the ammonia would be dissipated, and a long continued drought would injure the active principles of it also. By placing such refuse in water, the loss from emanations is not only diminished, but the disintegration required for productive application is rendered perfectly complete, and the time of the application wonderfully shortened, and the consequent loss, from adverse weather, saved. Extensive distributions of sewer water, as manure, and of other substances in the liquid form, have proved that parks in the vicinity of towns may, by this easy method, receive dressings of manure, at an early hour in the morning, and be free by the time they are visited, of all the offensiveness usually engendered by the common applications of manures. If the ground in the parks happens to be clay, the action of the urine and other liquid manures will not be mechanical only, but chemical, so that a beneficial combination will immediately be formed. A large portion of the valuable properties that are lost from decomposition and evaporation, by the retention of manure in the dry state, or in its application as top dressing, is saved by its being diluted and carried in water under the surface of the soil, among the roots of plants. The more minute the subdivision of manure is in the liquid form, the more rapid will be the decomposition, and consequently more complete the absorption. Mr. Barber had twenty-seven acres of land of such a quality naturally, that it was only capable of affording two cows a scanty allowance of food. He placed the manure of thirty-five cows and five horses in a tank, fed by a stream of water, and with the liquid he irrigated twenty-one acres, and with his house refuse six acres, and from the produce of this land he now fodders forty-four cows and five horses. Adjoining this farm there were some high knolls of land on which he placed a large share of solid manure, but could only obtain one fold, when the other gave him five.

Sir Joseph Paxton collects, at Chatsworth, the manure water from water-closets, horse dung and other sources, into large covered cisterns. The waste also of a small bath is emptied into one of these, by which means the solution becomes thin. The liquid so collected passes almost immediately into a state of incipient decomposition, and becomes well fitted for the pabulum of vegetation. When drawn off for use, it is greatly diluted with water, and never supplied except when the plants are in a state of active growth. At any other time, he thinks, the effects would be prejudicial. It is used by Sir Joseph, liberally, on vine borders, melons, cucumbers, pines, peaches, and various other fruits, with the most powerful and satisfactory effects. In fact, the use of plant food in a liquid state, if properly prepared and administered, supercedes the necessity for manure in the solid form; and the produce in favor of the liquid predominates in a wonderful degree—being richer in color, larger in quantity, greater in weight, and of superior flavor.

These advantages, however, are not certain, unless the liquid is prepared in such a manner as to suit the requirements and habits of the plant to which it is to be applied. The preparation is of two kinds: first, by sufficiently diluting with water to prevent the fibers from becoming overburdened with too great a supply of nourishment; and secondly, by rendering it of a proper temperature, by the sun's heat or the addition of warm water. Pines require the liquid to be raised to 80° of heat, and other plants in proportion. Out-door products do not require this attention, but still they are greatly benefited by receiving it in a moderately warm state.

For ordinary crops, there is no doubt but that sewage in its usual state is the most valuable of all manures.

The effects of liquid manures, when applied to the roots of vines, and to melons, are very apparent; the leaves immediately assume a rich deep green, become double the usual size, and produce quickly matured fruit, because the thin liquid is at once appropriated to use without loss, whereas that spread on the surface or dug into the ground is dependent on many subsequent circumstances before plants can derive any benefit from its application. Many of its most valuable properties are dissipated during the necessary preparation.

John Mitchell, Lord Ellesmere's gardener, states that he has never seen any manure produce so good a crop of berries as the liquid. Solid manure, he says, often causes a crop of strawberries to be lost, by forcing the growth of leaves. He applies the liquid just when the plants are forming their flower buds, and the strength of the manure is spent in producing fruit instead of leaves. When the plants were bearing, it could be seen to a plant how far the irrigation had extended. Of course, liquid manure may be misapplied in wet weather, and is subject to the casualties of storms, but less so than top-dressings of solid manure—thus saving time and diminishing risk. But whilst the effects of liquid manures are immediate on vegetation, they have been found in practice not to be transient in the soil, as it was supposed they would be. Professor Liebig says: "The reason why in certain years the influence of the best and most plentiful manuring is scarcely perceptible, is that, during the moist and varying springs and summers, the phosphates and other salts with alkaline bases, as also the soluble ammoniacal salts, are entirely or partly removed." A great amount of rain and moisture removes, in the greatest quantity, the very substances which are most indispensible to the plants at the time they begin to form and mature their seeds.

Intelligent farmers must give to the soil the enriching substances in such a state as to render possible their favorable action on plants during the whole season of their growth. Art must reduce the solubility of manuring matters to a certain limit, calculated to bring the plants into the same state in which they exist in a virgin soil. Agriculture should be placed on as sure principles as well conducted factories, so that it can be carried on with perfect security, and instead of looking forward to the results of our labors with doubt, our minds should be filled with confidence and patience.

Plants are best supplied with nourishment by watering them at short intervals, during their entire growth, with weak liquids composed of the elements which form their structure. It is established by the results of actual experience, that drained land upon which liquid manures are applied, the fertilizing matters do not escape through the soil, but are retained by it chemically, maintaining its increased fertility from season to season, though completely washed by every heavy rain that falls. Whereas, manures that are applied by top dressings in the solid form, are washed by heavy showers into the ditches and drains, as may be witnessed at their outfalls, by the turbid matter which they discharge. Where there are two outfalls from contiguous portions of the same field, the one from land that is thoroughly underdrained and top dressed with solid compost, and the other from the same species of soil irrigated with the strongest liquid manure, the contrast will be apparent to all. The former will present the appearance of mud, the latter of pellucid oil.

Simple and decisive proofs of the power of soils for chemical combination were given experimentally by Professor Way, before the Royal Agricultural Society of England, by passing large doses of urine and sewer water in a turbid and offensive condition through clay soils, and producing a liquid free from smell and clear as spring water. Where more manure is applied at any one time than the earth can absorb, the excess is, as might be expected, discharged through the drains. But if there be waste, the remedy is, not returning to the use of solid manure, with which there must be still greater waste, but in extending the application of the liquid, so that there may be land enough to employ it all.

It is now well understood that land manured by liquid, or liquefied manure, retains its fertility in a most remarkable and astonishing manner, and that the effects so far from being transient, have a very great permanency. It is a subject of common observation, that where there has been transudation through the pipe leading to the field, the mark of the line traversed is visible in the higher color and better growth of the grass in the second year. Land dressed with one dressing only of liquid manure during the season, but no dressing during the second season, will bear superior crops the second, as well as the first season.

It will be found that ten hogsheads of cow urine placed on an acre of wheat at the time of sowing, will produce a better crop than that manured with two cwt. of Peruvian guano, put on at the same period. Showing plainly that liquid manure lasts not only during the winter, but even until the harvest time of wheat, the latest cereal we grow, proving conclusively that the soil possesses the power of absorbing and retaining for the sustenance of vegetation, manure contained in any liquid which filters through it ; for it is evident that the liquid could not possibly be retained for so many months in the soil. These results show that there is no doubt but that liquid manure may be applied to the land when it is fallow with the certainty of the best incorporation, and that the deposit there will be safe and available for the subsequent crop. Applications during the growth of vegetation, prove that the application of liquid manure to land, may, under proper management, with the interruption of hard frosts only, be as continuous as its production, and dissipate the exaggerated estimates as to the extent of storage, and the great expense and inconvenience of the tanks required for such manure. The fertility to soil producible by liquid manure irrigation is a cumulative and continually increasing fertility, the limit of which has not yet been ascertained. We know that the average yield at Edinburgh has been four thick crops a year of grass eighteen inches high, and the collective weight cut is at the rate of eighty-one tons per acre, and that in some instances the weight of the ear in wheat was increased beyond the strength of the straw, and the crops were lodged; this might have been prevented by using miscellaneous manure containing the food of all parts of the plant, siliceous matter for the stalk, phosphates for the seed and nitrogenous matter for the herbage. By the addition of silica and nitrogen to the excrementitious matter of a given population, these ends may be readily accomplished. The former may be supplied by the proper disintegration of the soil, and the latter by using rain water which contains ammonia. If the soil should not contain silica, it may be economically added by macerating straw in the tank, or adding a soluble silicate directly. The question of the comparative agricultural value of night soil having been submitted to the consideration of the late Professor Hembstadt of Berlin, by the Prussian authorities, who were desirous to apply the contents of the city drains and cesspools to the recovery of barren and sandy lands in the environs of Berlin and Dresden, that eminent agriculturist undertook, in conjunction with other learned men, and with practical farmers, a series of experiments, which were carried on for a great length of time, and were varied in every possible way, in order to avoid all sources of fallacy. The results of those investigations Hembstadt afterwards published, and they led to extensive agricultural operations, all of which proved successful.

By far the most important point of practical knowledge in this matter, put forward by the same great authorities, and the truth of which was afterwards confirmed by many great farmers in East Flanders, is, that the manuring with liquefied human soil has produced fourteen times the quantity sown, where horse dung has only yielded ten. Accepting these conclusions as the result of actual experiment, they place an equal quantity of fertilizing matter in the form of town sewage above all other manures, considered with reference to its producing capability alone, irrespective of the greater pecuniary economy of its application. It has been invariably found that the miscellaneous nature of town manures, instead of being unfavorable, is favorable to vegetable production. In the instances of irrigation with compounded or miscellaneous manure, as compared with the applications of simple or comparatively simple manure, the grass which had received the miscellaneous manure was by far the richest, and the cattle went first to the portion of the field so irrigated. These results are in accordance with the principles of vegetable physiology, for the roots of plants possess the faculty not only of seeking their food, but, when they have arrived at it, to select that which is the most suitable to them; as Sir Humphrey Davy long since ascertained ; they do not take up everything that is presented to them. This which may be regarded as the selective power of the roots of plants, appears to be a most important property for practical application to the absorption of town manures, which, consisting of the remains of everything taken into the town, are in the highest degree miscellaneous. The quantity of the refuse and the coloring matters from dye works discharged into the rivers passing through manufacturing towns, often excites doubts as to the applicability of such waters for irrigation. But the dark coloring matter which excites attention is principally indigo and logwood, and the banks of such streams often exhibit the most luxuriant vegetation; for but little injurious mineral matter and much valuable manure is discharged from such works, and the important experiments of De Sausure on the absorption of poisons by plants, prove that plants do not suffer much by exposure to weak poisonous solutions. This fact is also corroborative of the view taken as to the importance of the extensive diffusion of manures in water, and frequent applications of weak solutions, rather than single or unfrequent applications of concentrated solutions with much solid matter in suspension. The fertilizing power of sewage and other liquefied manure appears to be similar, whatsoever is the nature of the soil, but is remarkably striking on sandy soils, from the contrast with their previous barrenness. Land that can be irrigated has only to be loose and permeable in order to develope the whole of the fertility which climate and manure can confer.

Rich crops of indian corn are gathered upon the plateau of the Andes of Quito in a sand that is almost moving, by being dexterously and abundantly irrigated.

In the year 1809 Mr. William Harley observing the inferior quality of milk in Glasgow, from cows kept in the town in close unventilated stables, built a cow house in which sanitary principles were applied in keeping the cows, and consequently improved the quality and increased the quantity of the milk. Instead of permitting the urine to stagnate in or near the cow stables, he applied it, with the most eminent success as a manure. The cow stable attracted so many visitors, that at length they became inconvenient, and a shilling each was charged for the exhibition, which raised a thousand dollars per annum. But this example of the successful application of the liquid manure gained no general imitation, indeed no known imitation whatever, among the farmers or cattle owners in the neighborhood, who thenceforward, and indeed at the present time, allow the urine to run to waste as nearly all the farmers in our country do. If you visit even the best farmers' barn-yards they will immediately point out the conveniences, and among the most prominent, a stream of water passing through the centre, which carries the urine and other fertilizing matters of the yard to the nearest stream, where it kills the fish, pollutes the water, and becomes a serious nuisance.

There is, perhaps, no portion of the universe in which the practical preparation or application of animal and vegetable manures is so perfectly understood as in China. The population of which is so enormous, that nearly the whole labor is performed by human beings, which much reduces the number of horses and working animals; consequently night soil forms the chief dependence of the agriculturist. It is dried throughout that vast Empire, formed into cakes, and sold as a commercial commodity. It is then combined with other substances, diluted with urine, weakened with water, and applied almost universally in the liquid.

When the speculator purchases from the vendor he forms a collection of animal substances, such as putrid fish, flesh, and blood, which are placed in a large covered tub, to which he adds urine and water, in sufficient quantities to fill it ; a mandarin then attends and affixes his seal upon the lock of the vessel; in which state it must remain for at least six months.

When this period has elapsed, the mandarin breaks the seal, and grants a certificate stating the quality of the preparation, which is carried by the proprietor and shown to those who buy the liquid for gardens, frequently in so small a quantity as a single pint. When used it is diluted largely with water, often five or six times its bulk, and is extensively used in gardens, but chiefly in drills.

Human urine prepared thus forms at least a quarter of all the enrichers used in China, and is not placed upon the ground until it has reached a very high state of putridity. That an article of such high consideration in China, should be so neglected even where agriculture has reached so great a state of perfection as in some parts of our country, is truly wonderful. The quantity of urine voided each day by a moderately sized individual, is half a gallon, and this with proper attention is sufficient for full half a rood of ground, which it will cause in a short time to assume a rich dark green, as it is highly conducive to the luxuriance of plants. The urine voided by a cow fed upon turnips, would be about a gallon for every thirteen pounds; if fed one hundred and thirty pounds of brewers' grains she would make forty-six pounds of dung, and a large quantity of urine. The calculation in Scotland is, that the urine of six cows will enrich a sufficient quantity of earth to top dress an acre of grass land.

Throughout a large portion of the plains of Tuscany, the manure used is principally procured from night soil, which is placed in enormous cisterns, and there steeped for four months in four times its quantity of water. Into this cistern all the putrescent matters they can obtain are thrown, and the liquid is found to possess admirable enriching properties, but is principally used for gardens, which are irrigated with it twice in each month; and it is said to be particularly advantageous to the growth of onions, which I have seen there the size of my hat. They possess a delicious flavor, not in the least affected by the manure, but when informed how they were raised I was foolish enough to refuse to eat them.

In Sweden the urine is collected from the farm buildings and thrown over the compost heaps until they become liquefied. The contents of privies are regularly purchased by scavengers in all the large towns, and often carried as far as fifty miles from Stockholm, and there diluted with water five times its bulk, and placed principally upon meadow land, where it is supposed to produce a good effect for five years.

In Switzerland it is called mistwasser, and is sprinkled over meadows by means of large hogsheads with perforated bottoms, immediately after each cutting, which causes the grass to spring with amazing vigor, as the fetid solution is essentially serviceable in that climate and renders it luxuriant and intensely green. A farmer there tried the following experiment; he drained a natural pond on his place and lined it with cement to prevent the water from escaping, he then laid drains into it from his stables, barns, privies and dwelling, which soon caused the water to become exceedingly putrid. A water cart was then used, with a tin tube bored with small holes arranged behind it, somewhat similar to a New York water cart, and twenty-two carts full of liquid were placed per acre on a contiguous meadow early in May, and after cutting the crop in July, and the effect was surprising, not only on the crop, but the aftermath likewise. There is no doubt but that it applies admirably to grass.

All urine possesses the essential elements of vegetable productions in solution. By a careful analysis human urine in its fresh state contains the following substances :

	Parts.
Water	93.200
Urea	3.210
Sulphate of potassa	0.371
Sulphate of soda	0.316
Phosphate of soda	0.294
Common salt	0.445
Phosphate of ammonia	0.155
Muriate of ammonia	0.160
Lactate of ammonia Animal matter Inseparable urea	1.714
Earthy phosphate	0.100
Uric acid	0.099
Mucous matter	0.032
Silica	0.003
	100.000

By inspecting the above table it will be observed that there is scarcely a single ingredient which is not a direct food for vegetable existence, in it may be detected the ammoniacal salts of the barn yard, phosphate of lime and an abundance of animal matters readily decomposed.

The urine of the horse is rich in vegetable matters, its composition is as follows:

	Parts.
Water and mucous matter	93.0
Urea	1.7
Carbonate of soda	1.8
Carbonate of lime	0.8
Muriate of potassa	1.7
Benzoate of soda	1.0
	100.0

The following are the matters contained in that of the cow:

	Parts.
Carbonates of potassa and ammonia	3.0
Water	75.0
Sulphate of potassa	7.0
Urea	5.0
Muriate of ammonia	16.0
Phosphate of lime	4.0
	100.0

The ammoniacal salts of all urine have a stimulating power, which has a wonderful effect in hastening the advancement of vegetation. How this ammonia is generated in rain water, the importance of the fact and its utility, and the uses of carbonic acid gas in the air, are matters that so nearly resemble living processes in plants and animals that our knowledge only permits us to make the statement.

The application artificially of water to land in large quantities is a thoroughly understood subject, and its surprising effects are recognized and marked in all parts of the universe known as strictly agricultural, and have been for many centuries. Irrigation is a mode of applying the very weakest of liquid enrichers on an extensive scale to grass lands. And all farmers practicing it have a mode of accounting for its fertilizing effects. Davy in his explanation imagined that a winter flooding protected the grass from the evil effects of frost. He examined with a thermometer certain water meadows, and discovered that the temperature of the earth was 12° higher than the water at the surface, on a cold March morning. He also remarked that waters which breed the best fish are the best for watering meadows. If river water is used, and it contains gypsum, which it invariably does if the water is hard, it will be found highly fertilizing to meadows, as all grasses abound in this salt. If one part of gypsum is contained in two thousand parts of water, and every piece of land a yard square absorbs eight gallons, then every flooding leaves a little more than 100 lbs. of gypsum (or sulphate of lime) on the soil, which is a quantity fully equal to that spread in the powdered form by farmers upon their clover, lucerne, and other crops. The generality of river waters contain about twenty-six parts of vegetable and animal remains in a thousand parts, consequently every soaking we give the land with such water we add two tons to the acre of vegetable and animal matters, and as we usually flood them five times a year, we add ten tons of organic matter to the acre. River water in ten thousand parts after its suspended matters have subsided contains:

Muriate of soda	0.02
Carbonate of lime	1.90
Organic matter	0.02
Sulphate of lime	0.75

The water of inland seas contain more of the above matters than rivers, and consequently are more valuable for irrigating purposes.

If a quart of river water contains a half a grain of ammonia, then a field of eighty thousand square feet must receive annually upwards of one hundred and sixty pounds of ammonia, or one hundred and thirty pounds of nitrogen. This is far more nitrogen than is contained in 2,900 lbs. of hay, or 2,700 lbs. of wood.

Another reason why liquids are more useful than solids is that the former contains the largest portion of its ammonia in the state of salts, in which form it has lost its volatility, and when presented in this shape not the minutest quantity of ammonia is lost to the plants, because it is entirely dissolved by water and enters by their spongioles.

If you desire to raise asparagus, sea kale, or any other salt loving plant in large quantities, irrigation with salt water will be found advantageous as it contains in every thousand parts,

25 of common salt.
$4\frac{1}{2}$ sulphate of soda.
$1\frac{3}{4}$ muriate of potash.
$5\frac{1}{2}$ muriate of magnesia.
$1\frac{3}{4}$ sulphate of lime or gypsum.

The sea by its continued evaporation spreads over the entire surface of the earth its salts, which are furnished to the roots of all vegetable productions by being carried to them by the rain, through the medium of the earth. The salts of magnesia, potash and soda are peculiar to the sea. If the proportions of sea and land were reversed, it is easy to see what the effect would be upon vegetable existence. All plants require potash, which may in many cases be replaced by magnesia, soda or lime, these substances can readily be placed in the irrigating liquid and thus given to the plants, which in turn yield it to animals for the formation of their bones, and they reject from their systems any excess that there may be in their liquid excretions. If two vegetables are made to grow in the same field, each withdrawing precisely the same food from the earth they injure each other, so corn and pumpkins planted as is customary together mutually injure each other. Though plants will grow well together when the substances requisite for their growth taken from the soil are of different kinds, or in fact when they are not each in the same stage of growth at the same period of time. If a soil is rich naturally in potash, tobacco and wheat may be grown in succession, because the tobacco does not make use of the phosphates, which the wheat does. Tobacco requires alkalies and nitrogenous food only.

If we grow wheat in the same field for years in succession, it annually leaves behind an excrement, which decreases the yield of every succeeding crop of wheat until it fails to produce at all; but if different plants are grown in succession, the first leaves behind an excrement which helps the second, and the second, that which may benefit the third, and the soil will be admirable for the three kinds. If, for instance, you sow wheat it will take a large portion of the silicate of potash from the soil, therefore, it should be followed by plants that make little use of potash, such as turnips and potatoes, and sow wheat again after four years have elapsed, and let the courses be

1st. Turnips, which will produce 26 tons of turnips and 8 tons of tops.

2d. Oats, which will produce 60 bushels and a ton and a half of straw.

3d. Clover and timothy, which will produce 2½ tons of hay.

4th. Wheat, which will produce 40 bushels and 2½ tons of straw.

If stock are not permitted to eat any of these crops upon the land the inorganic matter contained in them would be

	Lbs.
Soda	135
Magnesia	50
Potash	300
Alumina	12
Lime	310
Silica	320
Phosphoric acid	70
Sulphuric acid	115
Chlorine	40

making a weight of 1,352 pounds carried off the land; to restore it then to its original condition, we must add to every acre every four years

250 pounds of pearl ashes;
350 " carbonate of soda;
70 " of common salt;
250 " of quick lime;
152 " of sulphate of ammonia;
80 " of alum;
200 " of bone dust;

and these can all be supplied in the easiest possible manner through the medium of irrigation. The fact is that even our richest virgin soil composing the western prairies cannot and does not remain long unimpaired, unless those substances are replaced of which it has been deprived by continual cropping.

☞The fact to be borne in mind by farmers is that turnips and wheat are far from being natural productions, and as they are not, they impoverish the unassisted soil far more rapidly than the wild plants of the field do; potatoes and turnips in their wild state are unfit for food, and two fruits cannot be conceived more different in appearance, size and color, than the wild choke pear and the superb Bartlett, or the common crab and the magnificent pippin. Nature can and does feed them in their wild state, but if we improve them assistance by artificial nourishment must not be denied them, if it is they will degenerate, for nature cannot supply it in sufficient quantity. The time has nearly arrived when land will be manured with saline solutions, the ashes of burned rye, wheat, buckwheat, and barley straw, phosphoric acid prepared in factories, and all placed on the land through the medium of liquids, assisting the crops with the same certainty that quinine does the fever and ague.

Two exhausting crops should on no account succeed one another on the same land, because in structure they are alike and, consequently, take similar ingredients from the earth

Leguminous, culmiferous and root crops do well to alternate with each other, for the reason that their composition, structure, and excrementitious matters are different, and consequently cannot injure each other. If the first is a hoed crop let the second be a grain crop; nature recommends this course by always alternating her forests; the oak succeeds pine, the beech hemlock, and the cedar hickory. The strawberry vine flees from the excrement cast off from the parent stool and plants itself in new and uncontaminated ground, and the raspberry always changes its location through the medium of its roots. Natural meadows change their grasses, change, therefore, appears to be a law of nature and all man has to do is to study and follow her.

Gray in speaking of the agency of water, says, that it may be studied under its solvent properties, chemical agency, mechanical agency, and as affording food. It dissolves and holds in solution a great variety of substances, mineral, vegetable and animal, and is the great solvent in all nature's operations; and when it passes through the earth dissolves its soluble salts, such as lime, nitre, potash, salt, &c., and conveys them to the roots of plants; it takes up the soluble parts of vegetable mould as fast as the chemical changes in the soil renders them soluble and suited to the nourishment of plants. It also absorbs gaseous compounds, such as carbonic acid, ammonia and air. When soils are left to rest for a short period their renewed fertility is mainly due to water which causes the vegetable matter in the soil to decay chemically. The mechanical effect of water is to enter the outer husk of the seed, and divide the soil so that the roots may extend themselves; in passing over rocks it wears off the projecting particles which remain on it mechanically suspended. As nourishment it constitutes a large portion of the juices of plants; the woody fibre contains the elements of water, oxygen and hydrogen. In the state of vapor it ministers to the growth and life of plants which have the power of absorbing the water thus falling upon them. The dew conveys carbonic acid gas and ammonia to plants. In the form of snow it is highly beneficial to winter wheat and other crops. That a heavy fall of snow will protect and shelter the soil and crop from the destructive effect of any severe cold which may follow, there can exist no doubt; it forms a light porous covering by which the escape of heat from the soil is prevented; it defends the young shoots from sudden alternations of temperature to which the periodical return of the sun's rays continually exposes them, and when spring approaches, by melting slowly, it allows the tender plant gradually to accustom itself to the milder atmosphere; snow, likewise, contains ammonia and consequently nitrogen. Dew, celebrated through all times and every known tongue for its sweet influence, presents to our view a beautiful illustration of the agency of water in nature's economy, and exhibits one of those amazing adaptations by which animate and inanimate nature is bound together. The great importance of moisture to vegetation is obvious to all. Water constitutes a very large proportion of all plants, without which they either become stunted in their growth or die. In dry weather when all vegetation seems at a stand, no sooner does a shower of rain fall than an extraordinary growth of every variety of herbage at once succeeds, even on poor soils, where otherwise, no matter how well manured, growth would make very slow progress. The annual quantity of rain that falls in any country is of inferior consideration when compared with that of the general and equable distribution of that quantity throughout the days and months of a year. A great quantity at the same time is more hurtful than beneficial, whereas moderate showers falling upon well prepared drained land are great sources of fertility.

The utility of moisture is particularly remarkable in some respects; thus in wet climates cereal crops are found to exhaust the soil far less than in those where little rain falls. Oats injure a soil far more in dry climates than in wet ones. A soil of precisely the same quality will be far more productive in a moist climate than in a dry one; at the same time, moderately dry weather is by far the most favorable to a great production of cereals; wheat particularly is much more abundant if rain does not happen to fall when it is about to bloom; and a drizzling rain during warm weather when a crop of wheat or rye is approaching to ripeness is certain to mildew it.

OF THE WATER CALCULATED FOR IRRIGATION.

Clear spring water, in the state in which it issues from the mountains, possesses the most fertilizing quality, and near its source is far warmer than other waters and not liable to be frozen, and may be used if thought necessary in winter. Spring water may be used longer than foul water because it is not apt to render the grass gritty, therefore I give a decided preference to spring water crops. In regard to waters impregnated with iron, they were formerly supposed unfit for the purposes of irrigation; but it is now known that ferruginous waters are friendly to vegetation. I have used waters impregnated with the juices of bog meadows and peat mosses, which have been generally objected to because they were supposed to be loaded with antiseptic matters, with great advantage.

Such in vegetable economy is the indispensable agency of water; it is the vital fluid of all plants, upon its proper use the perfection, quality and quantity of all the earth's productions depend, particularly those intended for man's use. In the midst of this unbounded and incalculable profusion not one drop is wasted.

In respect to the time at which liquid manures may be distributed with the most direct effect on vegetation, it may be stated that the best season is when the rootlets are out and sound, and the plant is in action, and at different stages of their growth. On grass lands, in Scotland, sewer water is delivered eight times a year to each plot of ground; but it is used constantly on a succession of plots. The best practice gives it twice a week, with one plain watering in each interval. With sewage sufficiently diluted, the intermediate watering, which is desirable when strong liquid is used, will be unnecessary. The barrier to the adoption of frequency of delivery in agricultural practice, is the expense of the labor of delivery, which it has been the great object to reduce. By perseverance, more than is now performed in horticulture may be accomplished for agriculture. The best times for the application of liquid manure in agriculture are when the ground is not too dry, nor the sun bright, or wind high, as at those times circumstances are favorable to rapid evaporation. The weather should not be so excessively wet as to carry the manure away, but moist and even showery, to assist in its absorption. In March and April plants may be watered at all times in the day. In May, June, July and August in the morning and evening. In autumn and winter at any time except the afternoon. But put it on when you may, its application will be attended with advantage. The effects of guano will be quadrupled by distribution in solution in water, particularly when it is varied in intensity with the state of the weather, and of the soil, the greatest intensity being at the times when the rain will serve for dilution. When liquid manure is distributed over grass land in dry weather, the leaves should receive a washing of plain water to free them from the manure left on them. The experience in Germany on liquid manures is that when the liquid is applied as a top-dressing, care must be taken that in pumping it into the water cart in which it is carried into the field, no agitation takes place, otherwise the decomposed particles, consisting of vegetable fibre, will lie on the leaves of the young plant, and produce an injurious incrustation. In summer they apply it only in wet weather, otherwise the plants, when the soil is dry, will receive too concentrated a nutriment, and consequently become rather worse than better. They might dilute it more were it not for the labor of carting it out to the field. On account of this it is only applied there to meadows and fields which lie near their houses. In French Flanders, human soil is collected with great care, as it should, and eventually will be done everywhere. They have reservoirs for its preservation in every farming establishment, where there is always a cistern in masonry, with an arch turned over it, for the especial purpose of collecting this invaluable manure; the bottom is paved and cemented. The Flemish reservoir generally is of the dimensions of thirty-five cubical yards. Whenever the necessary operations of the farm will permit, the carts are sent to the neighboring town to purchase night-soil, which is then discharged into the reservoir, where it usually remains for several months before being carried out upon the land. This favorite manure is applied in the liquid state (mixed in water) before or after the seed is placed in the ground, or to transplanted crops after they have been dibbled in. Its action is prompt and energetic. They put it on with scoops, having handles twelve feet six inches long. They use it chiefly on tobacco, rape and flax, as these articles are of the highest market value. When intended for oats, they plough down the wheat stubble in November, and distribute immediately eleven or twelve hundred gallons of the liquid manure per acre; and the oats are sown early in the spring. For beets they use fifteen hundred gallons per acre. The price of Flemish manure at Lisle is 2½ cents for a measure, containing twenty-two gallons. And they think that this quantity, which will weigh 2 cwt., is fully equal to 5 cwt. of barn-yard dung.

A certain degree of fermentation in the manure, previous to its being applied to the soil, is essential in all cases. In general, clay soils, being more tenacious of moisture, and more benefited by being rendered porous and incohesive, may receive manure less decomposed than well pulverised soils of a lighter quality require. Some plants seem to thrive better with fresh, undecomposed manure than others, such as potatoes, for example.

But all the small seeded plants, such as turnips, carrots, clovers, and the grasses, generally require to be pushed forward into healthy, luxuriant vegetation, with the least delay possible, because they are exceedingly tender during the first stages of their growth, and this can be done more readily with well diluted liquid manure than in any other way. At all events, whenever liquid manure is used, the object should be to produce an immediate effect, that the plants may not remain stationary, at all. Ground bones, or bones dissolved with sulphuric acid, should be mixed with the liquid manures, as fifty per cent. of them are composed of fatty matter, cartilage, and jelly, which are entirely constituted of the same elements as plants, and all of them, sooner or later, will be absorbed by the roots. The cartilage in bones, when they are used dry, is exceedingly indestructible, as it has been found in bones of very great antiquity, though not discovered in antediluvian bones. A hundred parts contain

Azote	10
Oxygen	25
Hydrogen	10
Carbon	55
	100

The composition of vegetables, exclusive of earthy salts, approximates to the above.

Azote	01
Oxygen	43
Hydrogen	05
Carbon	51
	100

The above analysis plainly shows that a large portion of the bones we apply to the land are at once consumed by plants as their elementary food, and the balance, consisting of lime, will be gradually absorbed. I would also recommend the use of soot in the liquid, as it is not only very advantageous to grass and the cereals, but proves injurious to all insects known to depredate upon those crops, on account of the bitter and acrid principle it contains. It will prevent the attack of the Hessian fly, and wire worm. Of the saline matters employed as manure, chloride of sodium, or common salt, has attracted the most attention; but there is among farmers a great diversity of opinion as to its value as a manure. It has, in many cases, been extensively used, though experience is opposed to its application in large quantities, as the margins of the sea are generally sterile; still soils which are known to abound in salt, often yield a very wholesome and nutritious herbage. I use it with liquid irrigation and find a spontaneous herbage follows its application.

AMMONIACAL SALTS.

The last products of the putrefaction of azotized matters being ammoniacal combinations, it follows that all salts, having ammonia for their base, must be useful when applied to vegetation. This is confirmed by the use of guano, which rapidly developes vegetation. I applied, in liquid manure, the sulphate of ammonia, and found that the effects were amazingly distinct, not only upon wheat, but grass meadows, where the yield was precisely doubled. Two hundred and ten pounds of wheat in the sheaf contains two and a-half pounds of ammonia, plainly showing the advantage it must be to that valuable cereal. Guano in liquid produced similar effects, and in our climate it should be used in no other way.

It is then probable that if guano, or sulphate of ammonia yield azote to plants, they enter their spongioles and rootlets, not as sulphate, muriate, or phosphate, because acids united with an alkali are not eliminated during the growth of vegetation, it therefore seems likely that ammonia, in order to yield its constituent azote to plants, must reach their organs in the form of a carbonate, as that is the salt that exercises a favorable agency.

OF THE PRODUCTION OF MANURE ON A FARM.

The forage consumed by cattle on a farm is the source of the manure formed there. It would therefore seem very easy to calculate the value of all made at the cow houses and stables daily. The way to do it is to obtain the quantity of azote which is contained in the dejections and litter, so as to be able to refer to a standard the quantity of manure made.

If these azotized matters of the food were not partly exhaled by the animals, it would only be required to find the quantity of azote contained in the food, to be able to decide on that contained in the litter and dung; but this it is impossible to do, as I will take a case to prove. Suppose a horse is allowed in one day

23 lbs.	of hay,	containing	1776	grains of azote.
12 do	oats,	do	1390	do
12 do	straw,	do	309	do
10 do	litter,	do	100	do
Azote			3575	grains.

Now, Boussingault assumes two per cent as the contents in azote of dry farm yard dung. If this is so, the food consumed by the horse, theoretically speaking, should form twenty-six pounds of dry manure; but a horse will exhale 420 grains of azote, all of which is derived from the food, and is therefore lost to the manure heap. Now, 386 grains of azote represent nearly three pounds of dry manure, so that the dry manure produced by the horse, kept in confinement, will be reduced from twenty-six pounds to twenty-three, in the course of a year. If this calculation is correct, the azote exhaled will diminish the dry dung nearly 1045 lbs.

The azote contained in the food of a cow is much more considerable in quantity, and the loss to the manure heap proportionaly larger, inasmuch as the amount she exhales must be added to that which goes to constitute the milk she gives. A cow produces less dung than a horse, which can be proved on scientific grounds. Suppose a cow consume thirty-four pounds of hay, and give sixteen and a-half pints of milk per day,

34 lbs. of hay contain	2675	grains of azote.
45 " of straw for litter, contain	124	do
	2799	= 20 lbs. of dry dung.

In twenty-four hours she exhales	385	grains of azote.
And in the 16½ pints of milk	803	do are carried off.
	1188	= 9 lbs. of dry dung.

The thirty-four pounds of hay digested by the cow, with the litter added, only produced the small quantity of dry dung named. The azote of the food not being found in the excrement, amounts in a year to thirty-three hundred and ten pounds. When the deficiency in the horse amounts to only ten hundred and forty-five pounds.

Harold Littledale, Esq., has a farm in the county of Chester, England, which contains nearly five hundred acres of land, the geological stratum of which is the lower new red sandstone, with a combination of diluvial drift, and the alluvium of the estuary of the Mersey. Mr. L. has drained all the land capable of being drained. Both pipes and tiles are used. Some of the drains are laid two and a-half feet deep, others four feet, and latterly the depth has been five feet; it has been increased as the result of experience. The widths apart vary from eighteen to twenty-seven feet. The cost was twenty-five dollars per acre. His tank, for liquid manure, is brick, sixty-two feet long, thirteen feet wide, fourteen feet deep, with a capacity equal to about 59,000 gallons, and cost one thousand dollars. The steam engine is a high pressure ten horse power, ten inch cylinder, with thirty inch stroke, works forty-three strokes per minute, with twenty-eight pounds pressure on the square inch.

At full speed it works sixty strokes per minute, cost $400. This engine grinds, chops, crushes, steams, churns, threshes, pumps liquid manure, saws and performs all the farm work capable of being done by machinery. The irrigation does not require a four horse power, the blacksmith attends to the engine, shoes the horses, and does all the iron work of the farm. It only works one day per week for manuring. The distribution of liquid is conducted by a man and boy. The engine when working consumes ten hundred weight of coal per day, the proportionate sum per week, due to irrigation would be 41 cents. There are two pumps, each four incher diameter, with twenty-four inch stroke, and working twenty-six strokes per minute, at this rate of working they are capable of raising 42,000 gallons per day of ten hours. The cost of the pumps was $350. The liquid manure is conveyed by iron pipes three inches in diameter to the extent of two miles, which serves one hundred and sixty acres, the cost of pipes including laying is forty-two cents per yard. There is a hydrant for every three hundred yards of main and cost each $4.50. The pipes are so arranged that with one hundred and fifty yards of hose the distributor and boy can irrigate ten acres per day, or an acre an hour, with 4,115 gallons of liquid per acre for each application. The hose pipe is gutta percha, and consists of seventy-five yards, one and a half inches in diameter, costing fifty cents per yard. The liquid manure is now sent out to a distance of half a mile, and the jet from a circular orifice of an inch in the discharge pipe will rise ninety feet high and falls like a shower seventy-five feet, from the distributor. Mr. Littledale's capital account stands thus :

Tank	$1,000
Proportion of engine	300
Two pumps	350
Iron pipes	1,675
Hydrants	50
Hose two inch	50
" one and a half inch	35
	$3,460

The interest and working expenses including coal is about three hundred and forty dollars; equals about $1.25 per acre This mode of fertilizing has not been long in operation on this farm, but liquid manures have been applied there for some time by the more expensive and clumsy method of carting on the land; like the Duke of Southerland's, therefore, this farm is in the transition state. The mode of emptying by a pump and hose, whatever may be the distance required for the conveyance of the manure, will be found to be far cheaper than the water cart. With the hose the refuse may be placed on gardens, lawns and places where the cart cannot go and at all times. With the pump it may be carried to all heights under one hundred and thirty feet, and the hose may extend to a mile or more. Within such lifts as eight feet, and over all descents, the labor of pumping which would be required to get the liquid manure into a water cart would, with the hose, convey it half a mile. According to the estimates already given the expense of the fuel and labor for the distribution of about 4,115 gallons of liquid manure by the hose and jet would be sixteen cents. The quantity is equal to twenty loads, and the distribution by water cart, including the pumping from the tank, carrying half a mile and laying on, would cost sixteen cents for a load, or $3.20 for 4,115 gallons. On this farm liquid manure produced a crop of swede turnips equal to that produced by thirty tons of solid manure, which cost $12.50 for application, showing that it is only waste of time to make further remarks on the comparative economy of laying on liquid as compared to solid manure. Mr. Littledale has had this farm about eleven years and has erected a lodge, a house for the bailiff, and eight cottages for the laborers. A million of bricks were made out of two old marl pits, and the excavation was then converted into a water reservoir for the whole establishment. All the spouts of the buildings run into it. The water is pumped by the engine into a raised cistern of wrought iron holding ten thousand gallons, and thence distributed by taps.

The present live stock yielding manure consists of 81 cows, 2 bulls, 100 hogs and 12 horses. All the liquid from the stables, cow houses, piggeries, yards, cottages and bailiff's house drains underground to the tank. As the general result of drainage, liquid manures, and other improvements effected by Mr. Littledale, the yield of the whole farm is more than double what it was ten years since, though the manure has been hitherto applied to nothing but grass. He has eighty acres of Italian ray grass, which forms the earliest food for the cows, and nothing is bought except malt grains which cost six hundred and fifty dollars per annum; and he sells turnips, potatoes and straw; all the other crops are consumed on the farm.

The produce sold consists of calves, bacon, milk and butter. The annual produce of three of these items alone is as follows:

Bacon	$2,530
Milk	18,250
Butter	2,830
	$23,610

The district in which this farm is situated is very favorable for agricultural improvements, and within accessible distance of an immense population. It might reasonably have been expected that Mr. Littledale's example would have induced a spirit of emulation throughout the district, and that steam engines and liquid manure tanks would have been as numerous as the farms, still there is not another within five miles.

Mr. Romilly has a farm near Bristol channel, on which he has completed the following works for systematically applying liquid manure to about one hundred acres of land, the geological formation of which is the blue lias limestone, covered mostly with a heavy cold subsoil. There is first an open fresh water tank supplied by land drainage and holding about 56,000 gallons; there are three collecting tanks and one mixing, the following are their separate and aggregate dimensions:

13 feet 3 inches by 7 feet by 6 feet 6 inches equals	3,855 gallons.
31 feet 3 inches by 7 feet by 6 feet equals	8,703 gallons.
46 feet 6 inches by 7 feet by 6 feet equals	12,171 gallons.
22 feet 1 inch by 7 feet by 6 feet equals	6,781 gallons.
Total	31,510 gallons.

There is no steam engine upon the farm, the present application is entirely by gravitation. Sluices are put down in the tanks, and when those are drawn in the fresh water tank and one of the collecting tanks, the stream flows into a mixing tank and thence through iron pipes to the fields to be irrigated. In these fields hydrants are put down at distances of 120 yards, and the distribution is by sixty feet of gutta percha hose, and a jet pipe with a flattened orifice to discharge the stream in a thin heet.

The whole apparatus, including tanks, pipes for fifty acres cost $1,500. By reference to the aggregate capacity of the tanks they will be found capable of fertilizing five hundred acres of land instead of one.

The stock on this farm, producing the liquid manure, is on the average thirty-six dry and feeding cattle, two hundred and ten sheep, nine working horses, one hack, four or five young horses, and thirty hogs. No houses contribute to the liquid manure, but all the cattle-steddings, piggeries, stables and other farm buildings, and the percolations from the solid manure heaps goes into the liquid manure tanks. One man whose wages are fifty cents per day can empty the mixing tank twice in a day, and in so doing will go over four acres. The quantity, therefore, laid on per day would be say, 8,000 gallons, equal to six cents per 1,000. The working expenses are confined to the wages of this man, and the amount for each application would, therefore, be six cents per acre. The interest on capital invested and total charges per acre would be about $3.25; every extension of the pipes will reduce this amount; the soil on this farm is only twelve inches deep on an average, is underdrained with stones two and a half feet deep, and twelve feet apart.

Mr. Romilly applied the liquid to twenty-five acres of turnips, mixing it with about two hundred weight of guano to the acre. About twelve loads of farm yard dung per acre had been previously ploughed in and although the soil was bad, the crops were splendid; without the liquid, they would have applied thirty loads of solid manure, without producing an equal crop. The tops of the turnips were excessively small, the roots large, and it was discovered that by applying the liquid immediately after the turnips were sown, the growth of plants was so accelerated as to carry them out of the reach of the fly. There is something remarkable in the fact that those who have become accustomed to the results of using liquid manures systematically, should consider as a partial failure the production of eleven feet of grass in a few months, that is to say thirty and a half inches thick for the first crop, the same for the second, and the balance for the third, and the fourth an admirable pasture for stock.

From what I have said I do not wish farmers to infer that liquid manures can only be beneficially applied in wet weather. As I know very great advantages are produced by applying it in dry weather, particulary when manuring and watering are combined in the same operation. Liquid manure should be collected and raised to the altitude required in as concentrated shape as possible but when distributed and applied to the land, in such a state of dilution with water as the moisture in the land, state of the weather and season of the year may require. A man who keeps seventeen head of cattle, twenty seven horses, ten hogs, and twelve calves, will be compelled to feed them 333,580 lbs. or about 150 tons of forage per annum which will contain 6950 lbs. of azote, and produce on their original weight 20, 900 lbs. of flesh, milk, fat, etc. This food if properly husbanded, after leaving the animal in the shape of excrement, will yield 667,160 lbs. of dung.

This, should be chopped up, which permits it to be readily mixed, and placed in a large pile with a man on top of it with a three tined fork, with which he must turn up the manure, while another applies a powerful jet of clear water upon the heaps, which liquefies it. The water percolates through, and drains into the tank a strong solution of manure, the whole mass may, by a repetition of the process, be formed into so soluble a manure, that a hose under eighty feet of pressure and eight hundred feet long will distribute it without any fixed pipeage over ninety acres of land. A tank sixty feet long twenty feet wide, and twelve feet deep, will hold 80,000 gallons of it, and if this is situated on high ground, having an elevation of seventy-five feet over the ninety acres, the extreme distance to water will not be over 2400 feet, and the hose will require two men, one to direct the jet, the other to assist in moving it. The hose should be in lengths of thirty feet, readily joined together by screw couplings. At the end of the hose there must be a mouth piece five feet long and of the same diameter as the hose where it is joined on to it, and tapering off to the orifice which is five eighths of an inch in diameter. At a low pressure a larger orifice would be better, because the quantity is increased, while the length of jet is not materially shortened. Under high pressure, a smaller orifice gives a longer jet, but the quantity delivered is less. The length of the jet is a very material point in this system. In the following results the fall is taken from the top of the water in the tank. The diameter of hose and orifice as before stated.

Length of Hose—yards.	Fall in feet.	Length of jet in yards.	Gallons per minute.	Gallons per hour.
50	15	7½	21½	1290
50	24	12	33½	2010
140	20	9	25	1500
140	32	15	40	2400

The jet does not increase a great deal beyond fifteen yards, and may then be taken at fifteen yards, and the quantity 2000 gallons per hour, which is sufficient for an acre of land. The great advantage in this mode of irrigating is the despatch with which the work is accomplished; two men with hose being equal to eight men with eight horses and carts. Two men will do eight acres in eight days, whereas it would take two men with water carts five weeks and four days to do the same.

There is scarcely a farm house in the country that is not situated at such an elevation as to admit of its sewage being carried by its own gravity on to desirable land adapted for the formation of water plots of grass, and although they may be of limited extent, if they have to rely upon the house sewage only, yet where there is available water to dilute the sewage, one rood of land may be made fully equal in produce to four of ordinary pasture land, and will furnish grass for soiling early in the spring and late in the fall, which are periods when it is not attainable from any other source.

House sewage, drained through impermeable pipes into a water-tight tank, may be stored five days without becoming offensive, and may then be put on the grass early in the morning, without any of the inmates being aware, from the odor, that such a manuring is systematically going on. By this process a family of three persons are enabled to manure two hundred and eight square yards sufficiently to cause it to yield 1,790 pounds of grass in a season, which would be at the rate of 18¼ tons per acre green.

If the location is remote from the sea, it will be well to add a little common salt to the house sewage, as plants require it for their sustenance and growth, which they generally obtain from the soil. If the soil in any field contains naturally a sufficient quantity of common salt, or of chlorine and soda, in any other state of combination, it will be unnecessary to add this substance, or if added, it will produce no beneficial effect. If, on the other hand, the soil contain but little, and has no natural source of supply, the addition may cause a great increase in the crop. There are many localities in which we know it abounds, such as lands that lie along the sea coast, or which are exposed to the action of sea winds. Over such districts the spray of the ocean is constantly borne by the winds and strewed upon the land, or is lifted high in the atmosphere from which it descends afterwards in the rains. The quantity of rain which falls in the interior of Long Island in a year, brings upon each acre of land in that neighborhood 650 pounds weight of salt. This would be an excessive dressing if it all remained upon the soil. Heavy rains carry off a large portion of it. It is to gentle rains we look for the enrichment of our fields with the saline and other matters they contain. This consideration affords us the practical rule in regard to the application of salt, that it will be beneficial in places which are remote from the ocean, or are sheltered from prevailing sea winds.

Waste of urine on the generality of farms is enormous; the solid substances contained in it, if added to the land, would be far more fertilizing than guano, now worth $100 per ton, as it is worth much more pound for pound. If a farmer keeps one hundred cows, and suffers their urine to go to waste, his loss will be at the end of a year....... 1,300,000 lbs.

Twenty horses for the farm	20,000	do
Six carriage horses	6,000	do
Ten oxen.....................................	130,000	do
Ten calves....................................	70,000	do
Two hundred sheep..........................	60,000	do
Family, servants and workmen, 40 persons, a small calculation, as I have 80 on my farm....	40,000	do
Total....................................	1,626,000	lbs.

The saving of all this manure would pay the entire expenses of the farm, and leave a handsome balance for improvement. And if it could be preserved in our cities, villages, prisons, &c., it would be a great national benefit. What is thus carried off by the sewers, and ultimately conveyed to the ocean, is lost by the land, which must, to that extent, be impoverished, because we do not, in the form of sea weed, sea mud, fish or spray, get back a tenth part of the enriching matter it daily extracts from the land. And even those who do collect the urine in tanks, and preserve the liquids of their cow houses, fold yards and stables, meet with great loss by natural fermentation, because they neglect to wash out their buildings with water, which by daily diluting the liquid in their cisterns, would preserve the constituents from escaping into the atmosphere. And even when properly diluted, I think it is always best to convey it to the land without any unnecessary loss of time, for even in this state there is a constant escape of properties which impairs its value. But these remarks only apply to liquid manure after it has been collected. How enormous a waste is incurred by the farmer who makes no effort to collect, has already been seen.

The recent urine of a single cow in Flanders, where liquid manures are appreciated, is valued at fifteen dollars a year, but is actually worth $20. Let every stock farmer con over the facts above stated, give up the purchase of foreign manures, and learn to appreciate the importance of taking care of that daily going to loss at home. And it will be well to remember, that cows urine, when left to ferment for several weeks alone, and with an equal quantity of water, loses a large portion of its volatile matter, and in these several states will yield in a year,

	Solid matter.	Yielding ammonia.
Recent urine....................	910 pounds.	225 pounds.
Mixed with water seven weeks....	860 do	199 do
Unmixed after seven weeks.......	525 do	29 do

A horse will eat in twenty-four hours:

	Carbon, grs.	Nitrogen, grs.	Saline matter. grs.
Seventeen pounds of hay, containing..	45,550	1,510	9,000
Six pounds of oats, containing........	15,500	660	1,170
Total in the food.	61,050	2,170	10,170
Rejected from the lungs, &c..........	38,000		
Leaving to be rejected in the excretions	22,550	2,160	10,200
In the dung was left.................	22,550	1,180	10,540

This shows the food in passing through the animal loses a variable proportion of carbon, and little saline matter and nitrogen which possess the fertilizing virtues of the manure, and this will rapidly lose weight if left exposed in the farm yard.

1,000 pounds of dry straw and food will yield in fresh dung.	25 cwt.
At the end of 43 days....................................	20 "
After 57 days..	18 "
When half decomposed	14 "
When decayed...	10 "

Therefore, if you will use manure in this form, instead of converting it into a liquid, the sooner you draw it from your yards and plough it under, the better, unless the soil is open and light, and ploughing in fresh dung will make it more so, and thus injure its mechanical condition and chemical nature. I have grown severally upon sandy loam soil by means of liquid manure, 87 bushels of wheat to the acre, 100 bushels of oats, 428 bushels of potatoes, and 60 tons of turnips; on the same soil, after lying six years in grass, by the application of fresh manure ploughed under, 40 bushels of wheat, 200 bushels of potatoes, 30 tons of turnips, 50 bushels of oats, showing that the mechanical condition was changed. The average produce of sandy loam land is much below these quantities. The average of England in bushels per acre is:

Wheat................................	20 bushels.
Barley...............................	32 do
Oats	35 do
Potatoes.............................	240 do

In Scotland the average of cereals is—

Wheat	30 bushels.	Potatoes	6 tons.
Barley	40 do	Turnips	10 do
Oats	46 do		

In the United States the average is less than in England and Scotland; but as comparisons are odious, I will not make them. The quantity produced on any given soil is affected by the season, climate, soil, nature of the crop, variety sown, and method of culture; therefore it is difficult to discover the maximum produce of certain parts of any country, and the average production of the whole. The heavy crop of one year may not be reaped the next, though the soil may be treated precisely in the same manner, because the season may be cold, warm, dry or wet, which all farmers know exerts an influence; still, high farming will meet with but few failures, even on these accounts. The quantity of food which a field will yield depends upon the kind of crop grown; for instance, thirty-two bushels of wheat will yield 1450 lbs. of flour, six tons of potatoes will give 4,500 lbs. of dry, nutritious food. So turnips, clover, lucern, or cabbages, will furnish more than three times as much food for cattle, as a good pasture field will. Still more money can be made near a market for the hay, if sold off the farm, and this is allowable, where manure can be obtainsd in abundance for the purposes of top-dressing or irrigation. It is only near towns that these circumstances co-exist. Farmers living remote must raise fat stock, and sell their corn, or employ green crops in the production of cheese and butter, and must study the theory of rotation of crops, which informs us that the roots of nearly all plants throw off, by excretion, certain substances peculiar to themselves, which are injurious to the successful growth of the same family, but admirable as nutrition to other species. If rye refuses to grow after rye, it is because the rye had poisoned the land for plants of its own kind; if it is allowed to rest a year in fallow, the poisonous matter becomes decomposed, and it will grow another crop of rye; or, if you sow beans, their excretions will promote the growth of rye, if sown the following autumn. There is another reason why a second crop of the same grain will not do well, and that is, that the first crop has taken up too much of some necessary matter that the second crop needs. We do not meet with this difficulty in irrigation with liquid manures, because they add to the soil what the previous crop carried off, besides washing from the earth any impurities that may have been left in it; therefore, by its application, we may reap the same crop for an indefinite number of years. Besides, we may employ our liquid manures rich in nitrogen, which will much increase the crop, and if it consists of cereals, add to the gluten. Night soil, for instance, contains

Fatty oil	1.1
Soluble phosphates	0.7
Husk	15.0
Gum	0.5
Water	4.2
Albumen	1.3
Starch	40.4
Gluten	35.2
Sugar	1.9
	100.3

Bullock's blood contains the same in different proportions, and 34.2 of gluten, sheep dung 33.0 of gluten, goat's dung 32.8, horse dung 14.0, human urine 36.0, pigeon's dung 11.6, cow dung 11.0, vegetables decomposed 10.0.

Ordinary farming land, irrigated with the liquid of a barn yard, with either of the following named substances added to it, will produce as follows:

Night soil	14 fold.
Bullock's blood	13 "
Sheep manure	12 "
Goat's do	11 "
Horse do	10 "
Human urine	14 "
Pigeon's dung	9 "
Cow dung, pure	6 "
Vegetable manure	6 "

By the addition of wood ashes and sulphated urine to the liquid, the yield of wheat per acre, would be 42 bushels, yielding pure flour in proportion 67 lbs., gluten 11 per cent.

By the addition of sulphate of soda, the yield of wheat per acre would be 43 bushels, yielding pure flour in proportion, 65 lbs., gluten 10 per cent.

By the addition of chloride of sodium, the yield would be 41 bushels, yielding pure flour in proportion, 63 lbs., gluten 9 per cent.

By the addition of nitrate of soda, the yield would be 40 bushels, yielding pure flour in proportion, 53 lbs., gluten 9½ per cent.

As it is utterly impossible for the agriculturist to understand the laws by which nature's operations are conducted, in the vegetable kingdom, without some knowledge of the elements out of which all the products of vegetable growth and increase are elaborated, I will name them. They consist of fifty-five elementary bodies, as follows: Sulphur, nitrogen, oxygen, hydrogen, iodine, bromine, chlorine, phosphorus, selenium, barium, lithium, sodium, potassium, silicon, boron, carbon, fluorine, strontium, zirconium, yttrium, glucinium, aluminium, magnesium, calcium, thorium, cadmium, zinc, nickel, cobalt, iron, manganese, lanthanium, cerium, silver, mercuryuranium, copper, bismuth, tin, lead, palladium, tantalum, titanium, osmium, gold, platinum, iridium, tungsten, arsenic, tellurium, antimony, chromium, vanadium, molydenum, columbium. Some one says that, looking back at the vast strides which organic chemistry has made within twenty-one years, and is still making, and trusting to the continued progress of human discovery, that the time when the art of man shall not only acquire a dominion over that principle of life, by the agency of which plants now grow and alone produce food for man and beast, but shall be able also, in many cases, to imitate or dispense with the operations of that principle; and to predict that the time will come when man shall manufacture, by art, those necessaries and luxuries for which he is now wholly dependent on the vegetable kingdom.

Having conquered the winds and the waves by the agency of steam, is man really destined to gain a victory over the uncertain season, too? Shall he come, at last, to tread the soil beneath his feet, as a useless thing—to disregard the genial shower—to despise the influence of the balmy dew—to be indifferent alike to rain and drought, cloud and sunshine—to laugh at the thousand cares of the farmer—to pity the useless toil and the sleepless anxieties of the ancient tiller of the soil? Is the order of nature, through all past time, to be reversed? Are the entire constitution of society, and the habits and pursuits of the whole human race to be completely altered by the progress of scientific knowledge? To such end it is to be hoped that science is not destined to lead, as it would be sinful to wish for it.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

April 19, 1864.

Mr. Nathan C. Ely in the chair.

The chairman said he was gratified to-day by the presence of Mr. Solon Robinson, who has been confined to his house with severe sickness for the past two weeks, and he hoped the Secretary would record the pleasure we feel by having him with us to-day.

C. S. Osgood, Coos, N. H., furnishes the following information:

MAKING SPIRITS OF TURPENTINE AT THE NORTH.

I notice an inquiry as to whether, at present prices, spirit of turpentine could not be profitably procured from sapling pines in our Northern States. Years ago I conceived the idea of distilling the boughs of sapling pines, cut for wood, for procuring the oil of pine, which I suppose to be identical with spirits of turpentine, and now that the article is so high, I apprehend it might pay. Spruce oil used to be sold here as low as 18 to 20 cents per pound, which is probably equal to about $1,60 per gallon, and I apprehend that pine tops would yield much more oil than spruce.

MAPLE SUGAR.

There is every indication that we are to make a very light crop of maple sugar here again this season, which will make the third successive poor season. The sap will run but little in the most favorable weather, which we attribute to the thawy, irregular weather of the past winter, causing the sap to circulate so many times heretofore, that it has got tired of it.

But why should your market ever be glutted with it to the extent that it will find no sale at 7 or 8 cents? Do city people think it only fit for children to gnaw as confectionary? Hereabout we use no other sweetening when we can get that; but when from a short crop or any of us not having a sugar orchard, we cannot well get it, we have to put up with cane sugar as you city people do. For my part, for all kinds of cookery, preserves, &c., I prefer the maple flavor to most of the flavoring extracts in use, and in tea and coffee I regard it as agreeable rather than objectionable, and wild strawberries well preserved in it are not bad to take. So likewise the sugar, remelted with a very little water, and brought to the table hot, makes no unpalatable addition to the buckwheat cakes or other bread. Maple sugar contains less foreign matter than raw sugar from any other source, and that little agreeable.

But do you know that people who never went a "sugaring off," know nothing about eating maple sugar? It is comparitively worthless for eating after crystallization; but to have it in his prime, it should be done so dry that it will chill in hard, clear lumps when dropped hot on snow or ice, or will cleave off without sticking from the bit of an ax or other cold, polished metal. It should then be dipped out a few spoonfuls at a time, and spread thin on snow or ice, or suddenly chilled in some way, so that it cannot crystallize, when it forms a clear rock candy, and is *fit to eat*. But it will not keep long in this state on account of deliquescence, which is probably the reason that it is not sent to market in this shape; as if it could be it would sell like hot cakes. But any one can prepare it for himself by remelting sugar; or, better, by boiling down maple sirup.

I have seen much erroneous bosh in print about maple sugar, such as statements that it is not like cane sugar, but glucose, and that it is not nearly so strong as cane sugar, &c., which is all wrong. For maple sugar instead of being uncrystallizeable like glucose or fruit, or starch sugar, is, according to the best information I have on the manufacture of cane, beet, and sorgo sugars, the most ready crystallizeable of all sugars, and probably for the reason that it contains, as before stated, less foreign matter than any other. In fact, if made with only decent care, it cannot be prevented from crystallizing, so that maple sirup can hardly be thick enough to withstand hot weather, owing to its thinning, by throwing down crystals of sugar. And maple sugar crystallizes in remarkably large and sharp grains if undisturbed, and not done too dry. After the buds of the trees have burst or swollen much, the sap will not always make grained sugar, it seeming to have partially changed to gum. As to its apparent want of strength, that is owing to the fact that, as usually done off, it holds much moisture and is very compact and heavy, a pound occupying but little space; and it is apt to be compared by bulk rather than actual weight. But if done off quite damp, and after crystallization drained dry, it will be porous and light like other sugar, and the same weight will go as far as any. But in the draining it parts with much of its flavor, and color, too; and I have known a man to make a tun of it, without extra pains, that had a very pale, straw tinge, like coffee crushed. Refiners would, doubtless, find it the very easiest of all sugars to entirely clear of extraneous matter.

Tapping Maple Trees.

"I have tapped with from a one and a quarter-inch auger down to a 7-16th bit, which I now use entirely, and as I have never been able to determine but the latter gives as much sap in the season as the former. I use wood spiles, the end formed with an instrument like a pencil sharpener. I hang the buckets on 12-penny nails, with three-quarter inch of the points broken off, by holes bored in the buckets, which answers every purpose. I tap with a bit made on purpose by myself, made very like a large twist gimlet, which tapers to a worm at about two inches from the largest part. I bore at the first operation about half an inch over this largest part, so that the outside of the hole does not get altered in subsequent boring, which I calculate to give when the run is about half over, going about a half inch deeper, which, from the shape of the bit, renews all the hole except a little of the outside, which is left as at first for the spile. These holes in thrifty growing trees heal entirely over the second year. I entirely eschew tin or iron spouts, for one of them driven through the bark of a tree hurts it more than a half-inch hole six inches deep. But most people balk on this point. They don't mind wounding the outside of a tree; they think it can stand an indefinite amount of that, but they are very cautious of penetrating too deep, being fearful of touching the heart or some other of the vitals of a tree, not knowing that the vegetable economy is the reverse of the animal in this respect; that the vitality of a tree is upon the outside; that a worm running around it under the bark is sure death to a tree, while trees may fourish for a century with the heart entirely rotted out."

Maples by the Roadside.

What a profitable beauty, or beautiful profit, it would be to have our roadsides generally planted with sugar-maples. When they came into bearing condition, the population of most parts of the country could not begin to consume the sugar that could be easily and cheaply made from them, to say nothing of the beauty, diversity and shade.

The failures of transplanting maple and other forest trees result oftener than otherwise from bad selection. A majority of men in the country, should they be guilty of setting a tree at all, would know no better than to go into the old woods and select a tall, symmetrical (in the woods), a small tree—not young, as it would most likely be from thirty to fifty years old—and chop off all the roots not easy to dig, which would be nine-tenths in such a situation, set it out indifferently, and never water it, and then, when it comes to die, as soon it must, get discouraged at tree planting. But to succeed in transplanting forest-trees, we should find those that are young as well as small, that have vitality and plenty of roots, near home. And these can only be found in partial openings, or on the borders of forests; and when procured from such situations, and of such character, I know the rock or sugar maple, that "divine tree of the American forest," to be perfectly hardy to transplant. It is best, however, to do it just as the buds are opening in spring, as, if done earlier, or in the fall, the sap will run from the wounded roots, and likely weaken the tree.

Manure.

"Will the Farmers' Club tell me whether it is a settled question whether strawy stable manure is benefited or damaged by undergoing fermentation or heating in the heap? I have the past winter kept my cattle tied up in the barn all of the time except one or two hours per day, watering but once, water being distant. Having plenty of straw and other rough fodder, I have fed it to them very freely, letting them take what they liked, not expecting or desiring them to eat more than three-fourths of it, and littering them with the rest, letting all accumulate for a fortnight or until I began to bump my head against the scaffolding pretty badly, then throw out all that is wet, and begin again. I have thus got a fine heap of manure that smelled as it was going out as if it might be good for something. At any rate, I believe it much better than if the same straw had been thrown in the yard to be wet with snow instead of by the cattle, as is almost universally practised here. And my cattle, too, never before wintered so well on like fodder. But I have been in a quandary all winter as to whether I had better start a heat in the pile, and let it run through, but have concluded, on the whole not to, thinking that I should likely lose more in the volatilizing of the ammonia than I should gain in the decomposition of the straw. And I suppose the straw will make as good a return in time without as with fermentation—will it not?"

Mr. Solon Robinson.—By experiments made in England, it has been found that the increased value of housed manure over unhoused, was in favor of the housed of about one-seventh in value.

Mr. William S. Carpenter urged farmers in this vicinity to adopt the suggestion of Mr. Osgood, to line the roads with sugar maple. Maple sugar is now worth 21 cents per pound, and it is always in advance of cane sugar. Maple syrup is a great luxury for the table.

Manufacture of Maple Sugar.

Mr. Henry C. Blinn, a member of the Shaker community, at Canterbury, N. H., communicates the following information on this important manufacture:

In the manufacture of sugar we prefer substance rather than show, as we take pleasure in making a nice, clear and unadulterated article.

It is said that the combination of maple and cane sugar appears more delicate and does well for market, but as we have never adopted that course, we have no desire to introduce it. In fact we have never attempted the refining or whitening process in the sugar making as a general thing. With us it is thought to injure the genuine maple qualities, so eagerly sought for in the syrup and sugar. We have sometimes taken small quantities of sap and used tin pans or kettles for evaporators; this makes much lighter colored syrup and sugar, and is generally admired by those who love to please the eye rather than the palate. We think the tin imparts an unpleasant flavor; those, however, not intimately acquainted with the article, would be unable to detect the change. Again, there is a decided difference between the flavor and color of the syrup made from the first runs and that made towards the close of the seasons, and between the pure article and much of the would-be maple syrup and sugar offered for sale. Our experience teaches us that the more rapid the evaporation the nicer the sugar.

In this society we have three maple orchards, with camps well fitted for the business. At the largest, this season, we placed out 1,150 buckets, the others had some 600 each. We insert from two to six spiles in each tree, and use one or more buckets as the case may require. This large collection of trees are mostly of pasture growth, which are far more valuable than those of the woods, as they afford a larger quantity of sap and of a better quality. These have been tapped every year since 1824, and now look as thrifty as other trees in the vicinity, which have been tapped only a few seasons. We insert all the spiles at the same time, and endeavor to have them in running order as soon as admissible, being fully persuaded that the first run of sap is by far the best. It makes the choicest and best flavored syrup, and grains into the best quality of sugar. All that is gathered the first few weeks, after the harvest commences, is considered very valuable. From this a slight decrease is observed in the good qualities of the sap, till the close of the sugar harvest, when we find it less sweet, and so changed in composition, that it neither makes good sugar (i. e., not so light colored) nor satisfactory *stick jaw.* This last is a favorite article among sugar makers, and to be appreciated, it must be eaten while new, as it unfortunately changes to sugar in a few days. It is really a sweet and pleasant article, and first best to place before loquacious visitors. We tapped our trees this year March 1st, reamed ont a few hundred of the holes about the first of April, and pulled out the spiles April 16th. During this time we gathered 618 barrels of sap, or 19,776 gallons, which has made not far from 4,000 pounds of sugar. We generally use a $\frac{5}{8}$ bit and make a hole $2\frac{1}{2}$ or 3 inches deep. This year we have made our spiles of Red oak (Quercus rubra), and colored them black in Logwood dye. The trees are tapped about two feet from the ground and the buckets hung up. In our maple groves we have mostly the Rock and Red maple (acer saccharinum and acer rubrum). The Rock maple takes the preference for sweetness of sap; still there is a great difference in the quality of Rock maples, one noble specimen near the village has long been designated for the sweetness of its sap as the *sugar loaf.*

As our camps are differently arranged, we will make a note of each: One has four cast-iron pans, all placed at one height, and connected by a pipe near the bottom; this makes it a self-regulating boiler, as the sweetest part of the sap passes out at the bottom of the pans as fast as the fresh runs in. The second camp has, in connection with the cast-iron, one pan, the sides of which are made of wood and the bottom of sheet-iron; this is a rapid evaporator, and in careful hands does good service.

The camp belonging to the largest orchard having been rebuilt the past season, we have laid aside the heaters and cast iron pans and substituted copper. We have four pans—three of them are eight feet long, two feet wide and eight inches deep; the other, or syrup pan, is four feet long, two feet wide and eight inches deep. They are placed above and at the side of each other, so that the sap runs from the bottom of the first into the top of the second, and so on through the whole. Each pan is governed by a faucet. Our experience this season has proved it to be very satisfactory. With them we can boil thirty barrels per day, of fourteen hours, into syrup, or about two barrels per hour.

The sap is all drawn in barrels, from the trees to the camp on sleds. The situation of the camp is such that the barrels can be rolled from the sled into the boiling house; they are emptied into a large trough; passing from this it is filtered through sand before entering the boiling pan. When about two-thirds boiled down, it is taken from the kettle and strained through a flannel poke into a holder and allowed to remain a number of hours to settle and cool; it is then carefully drawn off and carried to another building to be converted into molasses or sugar. To sixteen gallons we now add two eggs and one quart of skim milk. The whole is now gradually heated, and as the scum arises it should be carefully taken off before the syrup is allowed to boil. After being well skimmed it is again strained through the poke into a holder, and the kettle thoroughly washed to remove all the refuse matter which might adhere to the sides. The syrup is then returned to the kettle and boiled to any desired consistency.

If it is intended for sugar take out a spoonful and pour it on snow or ice; if it becomes hard and brittle it will make good sugar; or pour a small quantity into a dish, and if in the right state for sugar it will continue to boil for some minutes after being removed from the kettle. It should be stirred very slowly when in the trays.

Prof. S. D. Tillman.—The amount of maple sugar made in the United States in the year 1860 was, in round numbers, 39,000,000 pounds. The high price of sugar doubtless stimulated farmers to tap, during the present Spring, more than the usual number of rock and red maples, and as the flow of sap is reported to have been very great, it may be safely concluded that the maple sugar crop of 1864 will far exceed that of any former year. Each farmer who produces sugar is also a manufacturer, for the sap is boiled down, granulated and cast into cakes, ready for the market, either in his own domicile or in the "sugar camp," generally located near the center of his maple grove.

HOW TO INCREASE THE FLOW OF SAP.

At my suggestion, the correspondent, Mr. Blinn, tested the strength of the sap drawn at various heights of the tree, the highest being taken at fifteen feet, and the result proved that the sap increases in sweetness, slightly, with increase of height. The sweetest sap tested was 3° by the Baumé hydrometer. The position of the tree was found to affect the strength of the sap; in trees near water-courses the saccharine quality was extremely diluted. Sap from the root of a tree stood at ½° Baumé. The first flow of sap being the best, it occurred to me that it might be increased by being allowed to pass into vacuum. I requested that a small India-rubber bag, from which the air had been driven, should be attached to a spile, or a vessel from which the air had been exhausted by means of an air-pump. The still more simple plan was proposed of placing a little water in a tin can and after heating it until the steam had driven out the air, closing it and attaching it by an air-tight connection with the spile. The first and last plans were tried, and with complete success. With the steam can, in which the steam was condensed when the can was withdrawn from the flame, the quantity caught in twelve minutes was four fluid ounces; the quantity which ran from the same spile in the usual way in the same time was 1¾ ounces, the increase of flow being about 114 per cent. Subsequent trials gave always over 100 per cent increase. The community at Canterbury have made some syrup from the sap of several varieties of the birch; also from that of the oil-nut or butternut tree, but they have not succeeded in granulating it.

The flow of sap in the maple is influenced by the weather to a great degree. The most abundant flow is just after there has been a white frost at night. A humid state of the atmosphere is considered preferable to a clear and cloudless day. At Canterbury a north-west wind is considered the most propitious; a southeast next best; east, medium. The winds from all other points of the compass are less favorable, while a breeze from the south destroys all hope. An occasional rain during the sugar season is beneficial, if the fall of water is very abundant, the flow of sap is greatly increased immediately after, but its sweetness is much diminished.

THE CAUSE OF CIRCULATION WITHIN A TREE.

It has been ascertained, by introducing coloring matter into the trunk of a tree, that the movement of the sap is upward through the wood alone; when the coloring matter has reached the nerves of the leaves its course is changed, and it is found to be gradually moving down through the bark until it reaches the bottom. The cause of the action was at first supposed to be the force of capillary attraction, but this does not account for the fact that the sap will flow out of a vine when the top has been cut off. De Saussure supplied the defect in this explanation by supposing that after the action was commenced by capillary attraction, it was continued by the alternate contraction and expansion of the tree, which, if true, does not account for the continuous flow. The sap was supposed to return by its own weight, but in drooping branches the return is in an upward direction. According to Thouars the rise of sap is due to the expanding buds and the development of leaves, which appropriate the juices in the vicinity; to supply the vacuum thus made the sap is forced up by atmospheric pressure; but this view is erroneous, because the sap flows before the buds are formed. Dutrochet, who first opened the path which Graham has successfully pursued, ascribes the flow of sap to that force of diffusibility which causes two liquids separated by a porous sheet of animal membrane to intermingle. He gave the name of Endosmose to the inward impulsion, and Exosmose to the outward impulsion. By osmetic force water will pass through a septum of animal membrane, covering the lower end of a glass tube in which there is a solution of sugar, and the action will continue until the fluid has reached the top of the tube, when it will continue to flow out. Vierodt states that the velocity of the current increases with the initial concentration of the solution, but in a lower ratio. The numerous experiments of Graham, recently made with mineral and animal septa, lead to the inference that osmose is caused by the chemical action of the liquid on the septum. In attributing the circulation of sap in trees and plants to chemical action rather than to capillarity, we may have advanced in the right direction, but it must be confessed that the subject is still enveloped in mystery.

According to Liebig, in annuals no new wood is formed after the month of August. All the carbon which the plant appropriates, after that time, from the carbonic acid absorbed by the leaves, is employed in the formation of nutritive compounds for the following year. Instead of woody fiber, starch is formed and diffused through every part of the plant by the autumnal sap. The chemical combination of carbon with the elements of water, by a process which cannot, as yet, be imitated by man, forms woody fiber, gum, starch and sugar. M. Heyer states that starch deposited in the body of a tree, can be recognized by its known form with the aid of a microscope. When by early cold weather, this provision is not made for the tree, its growth during the next year will be checked.

Why does the saccharine liquid flow from the Maple more freely after a frost? This peculiarity is not observed in the Birch and other trees which secrete the sweet principle. It would be accounted for on the Osmose hypothesis, by supposing that the flow was checked by the frost, and during that time the sap, already in the tree, became denser; this difference in density would cause the subsequent flow to be increased. It may also be suggested that this increased flow after a frost might be the result of thermo-electric action. Enough has been said to direct the attention of young American dendrologists, to this subject and induce them to institute many series of experiments in a field of research as yet but partially explored.

The Secretary—Mr. Henry C. Blinn forwards for the inspection of the Club specimens of the syrup and its products, viz:

Maple syrup made from the first run the early part of the season; one bottle of syrup boiled wholly in tin, this specimen is lighter colored than the other but no better flavored; one bottle of Oilnut syrup; one bottle of black birch syrup; one bottle of white birch syrup; a package of fine sugar, this was also made the first of the season, boiled in copper pans and finished in iron; also some cakes of maple sugar from themselves, and one from Gilsum, N. H., the latter are very pretty, of a light color, but we do not know the process of manufacture. It is said that "Gilsum beats the world at maple sugar." D. Smith of that place made 2000 lbs. the past season.

The samples of sugar and syrup were very handsome specimens and were very much enjoyed by the Club.

Mr. James M. Ford, Rowe, Franklin county, Mass., writes as follows:

"I have made this year 4,500 pounds of maple sugar from 750 trees, which has sold at an average price of sixteen cents per pound net, which makes $720. The expense of labor of men and oxen, with their board, interest on investment of capital, fuel and wear and tear, I estimate at $265, leaving a balance of clear profit of $455—not a bad month's work for a New England farmer. The amount paid out, aside from the labor of myself and wife, who sugared off the whole lot from sirup, was $65. You will see by the sample that the grain is not beaten all to pieces by the process of stirring, usually resorted to to make it a shade whiter, at the expense of spoiling the grain. If some of you could pay us a visit in sugaring time, we would show you how to make the article, and how to eat it too."

The sample sent was of excellent quality, and true maple flavor. It would sell at the present time at 25 cents a pound.

Mr. A. P. Johnson, Edwards, St. Lawrence county, N. Y.—It is one economy to get a large amount of sap, and another to preserve the health of the tree. For the benefit of thousands who will have the faith to try the experiment, I will say, plug up the hole made for the spout as soon as sugaring is over. It will entirely prevent the tree from decaying by excluding the air from the wound. For proof, pull out the plug the next spring and the sap will run. The plug should be driven tight and cut off close. The new bark will close over in two years so you can tap two or three inches above or below the old wound without encountering dead timber. I consider this very important.

SORGO—HOW TO INSURE THE QUICK GERMINATION OF SEED.

Mr. E. A. King writes from King's Ferry, Cayuga county, N. Y., the following seasonable information upon an important question:

"I notice in the proceedings of the Farmers' Club a communication from Mr. G. L. Andrews on sorgo raising. Among other things, he refers to its slowness of germinating. This with us, until the past season, has been the great drawback in cane raising, as it would not appear above ground until from two to four weeks from the time of planting; then the plants would be so spindling, and the soil so packed and covered with weeds, that it required considerable nursing to ripen it at all before frosts. Last season, however, our cane came up quickly, the blades in some instances appearing above the surface in four days' time, while in other cases, where the seed was planted without sprouting, they were three weeks in coming up. Our method of planting last season was simply as follows: A week or so before planting place the seed in boiling water; allow it to stand from three to five minutes; pour off the water and place the seed in a woolen bag; keep it damp and near a stove until the sprouts are from one to one and a half inches in length. This will occur in from seven to fourteen days. The sprouts will cause no trouble in planting, as they are of a tough texture, not easily broken. In this way we fully ripened three-quarters of an acre of cane, the seeds being as ripe and fine as any you ever saw. There was about six acres planted in this neighborhood. All will plant again this season. In fact, I have talked with scarcely a farmer but what intends to plant enough for his own use. The variety planted was the Imphee. Highest yield, 180 gallons to the acre; average 160."

Mr. Wm. S. Carpenter stated that the value of sorgo sirup, sent to this city, was materially affected by the fact that much of it appears to have an acid taste. If the manufacturers desire to obtain for it a good name, none but the best refined should be sent to market At present it does not stand as fair as New Orleans molasses.

ARE PARSNIPS EVER POISONOUS?

Mr. Thos. B. Haslam, Rochester, Olmstead county, Minnesota, inquires whether the parsnip becomes "poisonous in its second year's growth. One family with whom I am acquainted suffered severely, and had to call in medical aid, from eating some roots from a parsnip bed, which they found on the farm they had just purchased. I have been told of instances wherein it was said to have produced fatal results. Do the roots become poisonous by age? and at what age? Do they degenerate by hybridization with some other plant of the same genus? Does this liability occur in all climates?"

Mr. Solon Robinson.—Such has been the reputation of parsnips with all the members present, that where they "run wild," or grow uncultivated, the tops and roots are both poisonous. They do not hybridize, but they do degenerate in all climates. Several persons asserted that the roots always die after seeding. Others doubted. Who knows this?

Mr. Minot Pratt, Concord, Mass., says:

"Some experience as a seed grower enables me to say that in the second year's growth the leaves and stem contain an acid juice that is poisonous to the skin. In picking off worms from the flowers, and in gathering the seed heads when ripe, I have always found my hands and arms more or less marked with purple blotches, or blisters filled with water; and this happens whenever the leaf or cut stem rubs against the skin, except the hardened inside of the hands. Some persons suffer very severely whenever they undertake this work. But it does not necessarily follow that this juice would be poisonous if taken into the stomach, for many substances that poison the skin have no sensible effect on the coatings of the stomach. I have never suffered any inconvenience of this sort in weeding the parsnip beds the first season, though I always work with rolled up sleeves in warm weather. The parsnip is, as far as my experience goes, invariably a biennial plant, always dying when it has perfected its seed. When pulling up the old roots after gathering the seed, I have never seen one that did not show itself to be decidedly dead. If it were prevented by repeatedly cutting down the flowering stem, from maturing its seed, very likely it might live a longer time. I know that to be the case with some other plants. We often use parsnips without harm that have stood out over the winter and after the leaves begin to grow. After seed stems form, the roots are unfit for eating, being woody and not sweet."

Planting Forest Trees upon Prairies.

Smith R. Gunn, Lansing, Union county, Minnesota, wants information about cultivating trees upon the prairie, which, if it could be successfully accomplished, he thinks "would add many millions of dollars to the value of the west, and give vast additions to the supply of food at the east. The question arises how can timber be got to supply the wants of the country? If planting is the way to get it, how can it be got the quickest and best way; and what are the kinds to plant; how obtain the seeds, and when plant them; how far apart should they be planted, and how cultivated.

"We have growing in some sections of this county basswood, red and white oak, shell bark hickory, black walnut, butternut, sugar and soft maple, white and slippery elm, black and gray or white ash; the black and yellow locusts are growing well where planted; and there is also a tree here called popple, which is a rapid grower, is soft wood, of not much value, makes rather a poor quality of firewood, and soon decays; yet I think in planting a forest of timber it would be desirable, as it would be fit for use earlier than any other timber, and would make a supply until better timber could grow. Chestnut timber, I am told, grows rapidly. Now, what I would like from the Club is information how to obtain the seeds of the different kinds of trees enumerated; when they may be gathered, and at what time be planted; the distance apart they should stand in the forest, and the manner of cultivation; how many acres of timber should be planted to each farm of 160 acres, and such other information and suggestions as the Club may give.'

There has always been a difficulty in transporting seeds of forest trees, because several sorts will not readily germinate after having become dry. Chestnuts, hickory, acorn, and similar seeds should be gathered when fully ripe and packed in damp sand or moss, for transportation, and then placed in layers in boxes of earth to sprout, where the rodent animals will not eat them. Locust seed can be made to vegetate at any age by pouring boiling ley upon it to soak the hard shell. Nearly all kinds of seeds may be prepared in autumn to sprout in boxes and planted in nursery rows in spring. Transplant at one year old, cutting off tap-roots of such as grow them. Set them where they are to grow, twice as thick as natural in forest, and cut out the surplus from time to time.

From ten to twenty-five acres should be planted for each farm. The timber-planting that has so far proved most successful on the prairies is the common yellow locust (*Robina pseud-acacia*), and the white willow (*Salix alba*).

L. P. Noyes, Springville, Iowa.—I will give my experience of nine years. I have found nothing will compare with white or soft maple that grows upon most of the large streams and low lands in the northwestern States; for a vigorous grower and a beautiful tree, it has no equal. I have trees that are six years old, that are six inches through, and from sixteen to twenty feet high. The seeds ripen from the 10th to the 20th of June; the ground should be prepared as you would for corn; the seed should be planted as soon as convenient after picking from the tree, and should not be exposed to the sun long before planting. Mark your ground five feet apart, and plant in drills six inches apart, and cover one-half to one inch with well pulverized earth. I should recommend a location that was shaded with trees, as the rays of the sun are apt to injure them for the first few days; tend as you would corn. I have set out thousands, and have never known any to die if properly cared for. The timber is valuable for fence rails and mechanical purposes.

Mr. Solon Robinson said it was necessary that the hickory, butternut and chestnut should be gathered and packed at once in moist sand or wet moss; unless this method is pursued, there is very little chance of their growing.

Mr. Wm. S. Carpenter.—My experience differs from Mr. Robinson. I have kept the horse chestnut over the winter, and they have grown the following spring. I place them in a box with earth and bury them; in a short time they will be found to have sprouted; they are then taken and planted. I have been very successful in their propagation.

MEASURING THE QUALITY OF MILK BY A HYDROMETER.

Mr. Geo. Adams, Hopkinton, Mass., says: "I have an instrument called a hydrometer, which professes to indicate the richness of milk and to detect the presence of water. It is a simple instrument eight inches long, and marked with a scale allowing forty degrees between pure milk and water. I have no doubt, from trials made, that this instrument will show the specific gravity of any liquid, but is it true that the quality of milk is indicated by its specific gravity? Is not the specific gravity both of water and cream less than that of milk?"

The Chairman.—The man is mistaken, I think, in the name of this instrument. The hydrometer is an instrument in universal use among distillers and liquor dealers to measure the percentage of alcohol. There is another instrument in use among oil merchants to measure the purity of oil. I do not believe that either of these instruments would be of much use to determine the purity or value of milk. The olemeter might determine the relative proportion of fatty matter in different specimens of milk; it would not determine how much water it contained.

Mr. Solon Robinson.—There is an instrument called a lactometer, that is used to determine the relative value of milk of different cows, for butter. A case containing a number of glass tubes, or long vials, each graduated alike in degrees cut in the glass, is filled with milk, and the thickness of the cream is measured by the marks, and that of each cow compared. If one is found to give but a small yield of cream, she can be discarded as unfit for a butter dairy. She may be the most valuable in the lot for a city milk farm, or for a cheesemaker.

REMEDY FOR MELON BUGS.

Mr. D. K. Emerson sends the following from Stoughton, Wisconsin: "I tried a remedy for melon bugs with success last season, which I have not seen noticed. It was simply a strong decoction of aloes, applied with a stiff brush to sprinkle it with, or a small syringe. It coats the leaves but does no injury. It must be renewed after a shower or heavy dew."

Mr. Belden Shepard writes from Wheatland, Hillsdale county, Michigan, that he is eighty-four years old, yet he still feels much interest in agricultural improvement, and reads the reports of this Club with so much satisfaction, that he desires to contribute his mite. He says: "If you will plant a few poppy-seeds in each hill, and let one stalk grow till bug time is over, you will not be troubled with their company. I found this out by accident, and have followed it for seven years, and the bugs do not trouble my vines. It would be well to plant the poppies so that they will be up or nearly so before you plant your cucumber and other vine seeds."

AMERICAN TEA.

Mr. Emerson also writes: "With regard to the tea plant so called (Ceanothus Americanus and its varieties), it grows in abundance in this vicinity; but can any one give us any account of its having ever been chemically analyzed? Does it contain a single particle of *thein*? If it does not, it should be known, as it will save much useless speculation."

Dr. Trimble.—There is no plant known that yields *thein* beside the true Chinese shrub *thea viridis*, or *thea nigra*, and it is useless to try to find any substitute.

Several others thought not—that if we can have something that will satisfy people, whether it contains *thein* or not, it will be so much gained—so much in favor of American productions.

Mr. Wm. S. Carpenter said that he had lately tasted a very palatable tea made of raspberry leaves, and learned that they were used to considerable extent among the poor people of West Maryland.

CLOTHES-DRYING MACHINE.

Mr. N. Gale, Boston, thinks that farmers' wives would be greatly benefited, for they read the reports of the meetings of this Club, if we would tell them something about Howe's clothes-drying machine.

Mr. Solon Robinson.—I can speak favorably of this machine, several of which have been contributed to the Sanitary fair. It is a mode of drying a washing of clothes far more convenient than the one in common use by a line stretched upon posts. The line is all fixed upon arms which are attached to a post, and hoist up and down and revolve, so that all the line can be hung full in a snowy or wet time from one stand point, and then the whole hoisted up in the air, out of dust or danger, and where they dry quicker than upon a straight line. It is worthy of attention from all housewives.

ECONOMICAL HORSE FEED.

Mr. B. C. Cavessy, Collinsville, Ill., says that he keeps his horses in good working order with three feeds a day of cut straw, mixed with two quarts of wheat bran and four quarts of corn meal.

We should think that he might. This would be twelve quarts of meal and six quarts of bran, eighteen quarts, weighing twenty-four pounds per day. The hard-working car-horses in New York are kept in order upon thirteen pounds of hay and seventeen pounds of meal per day.

A GOOD GRAFTING CEMENT.

One pound of rosin, five ounces ninety-five percent alcohol, one ounce beef tallow, one tablespoonful of spirits turpentine. Melt the rosin over a slow fire, add the beef tallow, and stir with a perfectly dry stick or piece of wire. When somewhat cooled add the turpentime, and last the alcohol in small quantities, stirring the mass constantly. Should the alcohol cause it to lump, warm again until it melts. Keep in a bottle. Lay it on in a very thin coat with a brush. In a room of moderate temperature the wax should be of the consistence of molasses. Should it prove thicker, thin it down with alcohol. It is always ready for use; it is never affected by heat or cold, and heals up wounds hermetically.

DITCHING MACHINES.

Mr. J. B. Frisbie, Baldwinsville, Onondaga county, N. Y., wants "a ditch or drain digger that can be worked by horse power, instead of and at less cost than a 'son of Erin,' with a pick and spade, at 35 to 40 cents a rod. We want a machine, simple, strong and durable enough to make a drain from two to four feet deep, wide enough on the bottom to lay from two to six-inch tile; one that will dig in a hard, gravelly, stony undersoil, that requires a pick when dug by hand, to work it up so that it can be shoveled. There may be such a machine, but it has never been my good fortune to see or hear of one. If there is no such machine, who will be the man to try his ingenuity, for the want is becoming more urgent with every year, both on account of the scarcity of laborers and the continued increasing wetness of the soil; for lands that fifteen or twenty years ago would bear good crops of wheat or corn, now, owing to the cold dampness of the soil and want of under-draining, they fail entirely, or are at least no more than half of what they formerly were, although the land may be bountifully supplied with manure. Now, it is evident that underdrains are what we must have for successful cultivation, and on an economical scale, if possible, in order that farmers, with small capital for improvements, may try it. Can the Farmer's Club tell me whether there is such a machine ?"

There are several machines that are aids to the work of ditching, but none that supersede the pick and spade. Page's ditching machine works well in soft soil, and there are two or three patent ditching plows, with which the earth can be loosened so as to make the hand labor easier. But after all, it is a simple question of cost of machine-work compared with hand-work, and, so far as we have been able to judge, the advantage has generally been with the spade and pick.

A Fibrous Weed.

Mr. J. W. Bennett, near Terre Haute, Ind., sends a sample of a fibrous weed that abounds in corn fields, and wants to know if it could be utilized. He does not know its name. It has a rank sickening odor, while growing, and where standing single, branches out, and makes a large bushy weed, with a yellowish blossom, and seed grows in a boll or pod, simply, at the end of branches.

The sample of fiber from one stalk is four feet long, not strong as hemp, but as abundant on the stalk, and it is just barely possible, would be worth cultivating. We have no faith in anything yet discovered, to supersede flax and hemp.

Cut Corn Stalks for Cows.

Mr. Harmon Allen, Milan, Monroe Co., Mich., says that he has had much experience in feeding cut corn stalks to milch cows. He says "I have never found anything better in the fall than cut corn stalks, nor anything poorer in the spring. Take the stalks immediately after husking the ripe corn, and commence cutting them for the cows, and they will eat them with avidity, and give as good a yield of milk and a better color than any other food I ever used, until the natural juice of the stalk has become dried out. After that, cows will reject them, unless starved to it; and I consider them perfectly worthless. What is left after they become dry—I agree exactly with a farmer who wrote for the Club some weeks since—stack them in small stacks, salt them, and feed once in a day or two, so the cattle will not get too much salt, and they will eat all that is worth eating. Nor has my plan of feeding ever produced 'mad itch.' In regard to feeding stalks green, I have been in the habit for years of sowing a small piece of corn to cut up green for teams, and never found any food superior to it for oxen, and never saw any 'mad itch' from that source. I have tried rutabagas for cows, but discarded them on account of the rank flavor produced in the milk. And now let me beg a favor of the Club. Some one wrote, a few weeks since, that saltpetre will neutralize the rank taste produced in milk and butter by feeding rutabagas, and gave the amount necessary to use. If any member of the Club can give the amount, or if the writer will give it again, I promise them I will experiment with it, and give the result to the public through the Club."

Mr. Solon Robinson—Dissolve an ounce of saltpetre in a pint of boiling water, and put a tablespoonful in the pail when you go to milk. For less than a pailful use a less quantity.

The Chairman said that he would rather not have any milk at all, than to use that which had been deodorised by saltpetre, which is so deleterious to health in whatever form it may be used.

Mr. Solon Robinson contended that the small quantity necessary to use in milk, when so widely diffused, has its poisonous qualities so neutralized that it will do no harm, and as he has proved its efficacy in correcting the turnip taste in milk, and has not seen any deleterious effects, he shall continue its recommendation.

A correspondent sends the three following items from Rolling Prairie, Dodge county, Wis.:

KEEPING BEES IN THE CITY.

It is claimed by some that bees can be successfully kept even in the center of as large cities as New York. Mr. Townley is reported to have kept them, with success and profit, near the center of New York, surrounded as it is with water. Mr. Langstroth says: "Bees may be kept with great advantage, even in large cities, and those who are debarred from rural pursuits may still listen to their soothing hum, and harvest annually their delicious nectar. If bees can successfully travel such distances as are necessary to gain the fields and gardens surrounding cities, it is an important matter to the denizens of populous towns. When all saccharine substances are as high as at present, if the town resident can secure his supply of sweets by the keeping in his residence a few hives of bees, it will be an item of domestic economy not to be overlooked. The introduction of the moveable frame will render their management a matter of no great difficulty. If experience proves that they can successfully gather enough stores for their own sustenance, and a surplus for their owner, the denizens of the city ought not to remain in ignorance of the fact. Will the members of the Farmers' Club give them the benefit of their observation and experience?

FILTERING CISTERN WATER.

It seems to be pretty generally admitted that soft water is the most healthful for drinking and cooking purposes. Rain water is about the only source of supply in most parts of the country. It then becomes an important matter how it can be cheaply and thoroughly purified. Will the members of the Club enlighten us on a simple and cheap way to purify the waters of our cisterns?

CRANBERRIES.

Can the members of the Club give us any information as to whether this fruit can be successfully cultivated in the dry soil of our gardens?

Upon the first of these, the Chairman remarked that bees have been kept to a limited extent in New York for a long time. He has often seen great numbers around the sweets of the wharfs and groceries. They are very fond of working at the bags of Brazil sugar. But city honey is not as good as that made from wild flowers in the country. Bees can be kept in the city at almost no expense, but if very abundant they would be a nuisance.

Mr. J. W. Chambers, Secretary of the Club, said that he had three hives, and they do as well on the average as bees in the country.

Mr. Solon Robinson.—One of the difficulties about keeping bees in cities is the swarming. They are much inclined "to take unto themselves, wings and fly away." If they do not do this, they create alarm, and if kept in any considerable number, would soon become intolerable. Be assured, the country is the place for bees—the city for flies. As to all "non-swarming hives," they are the products of minds *non compos mentis.*

As to cistern water, I use it every day as pure and limpid as though it came from a spring. It is filtered through cement pipes, which are almost as solid to appearance as our brown sand-stone, and yet perfectly porous. These pipes are the invention of M. R. Pierce of this city, and the secret of their porosity consists in mixing the sand and cement, with the least possible portion of water to make it adhere under powerful pressure. About ten feet of 4-inch pipe is laid down in the bottom of the cistern, one end cemented tight, and the other attached by cement to the pipe of the pump, so that all the water drawn has to pass through the substance of these stone pipes. When sediment accumulates in the cistern, pump out the water and clean it. Once or twice in the summer, if the water emits an unpleasant smell, sift in about four quarts of pulverized charcoal.

Cranberries have been successfully cultivated upon the dry, sandy lands of Long Island in gardens, by keeping the runners cut off, in the same way that strawberries are grown in hills.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

April 26, 1864.

Mr. Nathan C. Ely in the Chair.

HOW DEEP SHOULD WE DIG HOLES FOR PEAR TREES.

This question was put by the Chairman, in order to elicit some comments upon his present practice. He stated that he had a man now employed at his place in Norwalk, Conn., where the subsoil is of a rather loose, porous character, digging holes for pear trees. He has furnished him with a measure four feet long for the width of the holes, and half the length for the depth. Upon examination, after part of them were dug, he has concluded to lessen the depth four inches. Is this right? Of course the holes are to be partly filled with rich soil, upon which the trees are to be set.

Mr. Solon Robinson said he did not believe in the policy of digging deep holes. He preferred to have the ground well prepared by a turning subsoil plow, so as to make the soil all mellow, and then set the trees almost on the surface.

Dr. Trimble concurred in this; said that he would never dig to exceed twenty inches in depth, and the broader the better.

Mr. Bartlett related the case of a Mr. Davis, in Rhode Island, who prepared the ground thoroughly, twelve feet in diameter, and have the earth well purverized; the roots should be well spread out. These trees grew amazingly.

SENDING SEEDS AND PLANTS BY MAIL.

Mr. Solon Robinson.—I find in the *Country Gentleman* a statement in regard to sending seeds, plants and cuttings by mail in such a condensed form that I think it will be very useful to the members of the Club, and all who read the reports. It reads as follows :

"The late act of Congress in authorizing the sending of seeds, plants, and cuttings by mail at a low rate of postage, is one of no small importance to the great mass of the pepole, extended as they are over so wide a district of country. It is often difficult in many parts of the country to procure fresh garden seeds, cuttings of rare trees, and new and valuable plants, and to order them by express, even on express routes, the charges in many instances will exceed several times the value of the things ordered. But the late act of Congress authorizes the sending of seeds, cuttings, &c., at so low a rate of postage as to bring them within the reach of all. The law specifies '*seeds, cuttings, bulbs, roots, and scions,*' which may be sent in packages not exceeding four pounds in weight, the specified limits of the law, at a rate of postage of two cents for every four ounces, or the same for any additional fraction of four ounces, prepaid by stamps. Formerly these things were subject to letter postage, and were generally put up in oiled silk, which is quite expensive, but since the reduction of postage this mode of carriage has been so extensively adopted that paper has been prepared so as to render it impervious to water and air, and is now sold at comparatively low prices. This paper is prepared by giving it a coat of boiled linseed oil, with a small quantity of dissolved India-rubber added. Those who wish to prepare paper for their own use, can make an article equally good by giving it a coat of linseed oil, and when dry, or nearly so, give it a coat of shellac dissolved in alcohol, reduced to the consistence of common varnish. Fine manilla paper should be used. To insure the safe transportation of plants in the mail, the roots should be protected with a covering of half an inch or an inch in thickness of swamp moss, or that gathered from the logs or rocks found in deeply shaded woods, and on the north side of steep hills. The moss should be made moderately damp, and spread out upon the paper of suitable size, and with a small portion of the moss mixed among the roots. The whole is then rolled up snugly and tied, and then again covered with a wrapper of common post-office paper, to receive the directions, and marked 'Seeds' or 'Plants,' as the case may be."

HOW TO USE HEN MANURE.

A correspondent of the above paper recommends mixing five bushels of hen manure with five bushels of wood ashes, and one bushel of plaster. This after being thoroughly incorporated, he would use for corn by placing it on the hill, instead of under the seed. A medium sized handful is sufficient for two hills, to be applied by sprinkling it over the ground after the seed is planted. The mixture may be afterward advantageously applied as a top-dressing.

Mr. Wm. S. Carpenter objects to the use of ashes. He would much rather mix the hen-droppings with muck or loam as a divisor, and apply the ashes and plaster separately.

Mr. Solon Robinson said that he had used pigeon-droppings extensively; has now forty barrels on hand which he purchased in this city at a dollar a barrel. He mixes three or four times the bulk of muck, leaf-mold, rotten sods, or any good soil as a divisor, and uses the compost for all sorts of crops.

Soil for Flowers.

Mr. Solon Robinson.—The Gardener's Monthly contains the following excellent advice in regard to the best soil for flowers: "Very few understand that an occasional change of soil is very beneficial to flowers in beds, though all know how important it is to flowers in pots. There is nothing better than surface soil from an old pasture, taken off about two inches deep, and thrown into a heap with about one-sixth part of old hot-bed dung, partially to decay. In addition to this 'staple' item, a smaller quantity of different matters should be gathered together for peculiar cases or peculiar plants. Peat, for instance, will be found very useful for many kinds of plants. This is not, as is often supposed, mere black sand, but a spongy, fibrous substance, from the surface of bogs and boggy wastes. Sand should be collected sharp and clean; the washings from turnpike ditches are as good as anything. Leaf-mold is best got already well decayed from the woods. A load or so of well decayed cow manure is a good thing for the gardener to have with him, as all those plants which dislike our hot summers and want a cool soil to grow in prefer it to any other manure. A small pile of hot-bed manure is almost indispensible to a gardener."

A New Dumping Wagon.

Mr. J. R. Davis, Bradford, Vt., exhibited the model of a dumping wagon manufactured by Mr. J. W. Nye, Fairfield, Vt., which in the unanimous opinion of those present is a most valuable invention for farmers. A load can be dumped from this wagon, whether it be one of dirt, stones, manure, potatoes, or other material, more readily than from a cart. As a manure dropper, it is altogether superior to the cart. The wagon bed is divided into four sections. The bottom of each section and a crossboard being firmly united so that the contents of each section can be dumped separately, and these sections are so arranged that they work easily, being no more liable to get out of order than an ordinary wagon bed, and but little more expensive. The very highest recommendations of some of the best men in Vermont who have used this wagon were presented to the Club, who fully agree with them in their opinion of its merits. We, therefore, commend it most heartily to farmers as a valuable, new, labor-saving farm implement.

Bran as a Fertilizer.

Mr. J. R. Davis, Bradford, Vt., stated to the Club, that bran had been used in that vicinity as a manure for potatoes, with the most beneficial results.

Gooseberries—How to Grow Them.

A Rhode Island farmer sends the following statement in answer to the question: Whether English gooseberries can be grown free from milldew?

"I find no difficulty here, provided the bushes are protected from the sun; they will do well under the shade of large trees where the over-hanging limbs are high enough to give two hours' sun night and morning, and little or none in the middle of the day. The best shade to erect is a scaffold laid of brush high enough to admit the sun morning and night a couple of hours, and dense enough to admit little or no sun through it the rest of the day—try it and see.

Mr. Robert Willis, an Iowa farmer writes that "in this part of Iowa we have a native gooseberry, which never fails to bear good, healthy fruit. The berry is smooth like the currant; is fit for use in early summer. Now, if you, or any other member of this Club, think it worth while, to say that you desire a few roots of our native gooseberry, and will give directions for putting up, I will forward them gratuitously."

This friend is informed that several members of the Club would gladly try this variety. He will see by the above directions for sending things by mail, that he can forward a package of half a dozen small plants for a mere trifle. Direct to the Secretary of the Farmers' Club, American Institute, New York.

Dr. Trimble.—I can only say of this Rhode Island man, who succeeds in growing gooseberries in the shade, that he is a lucky one. I have known a great many attempts to grow the English gooseberry in shady situations, which have failed, and in all of my acquaintance I know of but one garden where they succeed, and there, just as well in the sun as shade. I believe we shall have to stick to the American sorts. I saw a kind last summer at Dr. Underhill's which originated with the Shakers, growing perfectly healthy upon large bushes, and the fruit, though not as good as some of the foreign varieties, is much more worthy the attention of cultivators. The only safe method to prevent mildew, is to plant the native American varieties.

Mr. Geo. Bartlett said he did not believe it was necessary to shade gooseberries, to grow them well in Rhode Island, for he had grown several sorts there in open ground, which Englishmen said were as good as those grown in their own country.

Reclaiming Marsh Lands.

Mr. James Walker writes from Orono, Iowa: "In answer to the owner of marsh lands in Michigan, as to what he should do with such land to reclaim it, I can inform him how the same kind of land was reclaimed in Scotland. After it was ploughed, and the sod partly rotted, clay was hauled, and the surface covered one or two inches deep with it, then dragged and oats sowed on it and dragged in, and clover was sowed and the land rolled, there was very little difficulty in getting tame grass to grow on such soil there, but the clay made it firmer, and kept it from drying out. The greatest difficulty in farming deep marshes (called peat mosses or moors), was the softness of the soil, making it hard for a team to walk on it without miring, in wet weather. As to the cost of hauling clay it will depend on the distance, whether it will pay."

And that we conceive, will be the grand difficulty with all the Michigan farmers. It will not pay to reclaim the marshes by hauling clay upon them, where land is so cheap as it is in that State. Upon Cape Cod it has paid well to cover marshes with sand at a cost of several hundred dollars per acre, for the purpose of growing cranberries. Some of the small marshes of Michigan might be covered and planted with the same fruit, but there are many marshes in that State which will not be drained or cultivated in this generation. The reason is simply it wouldn't pay.

OXEN VERSUS HORSES.

The same correspondent writes: "Also, in reply to R. G. Belle, Le Praysville, Ind., inquiring whether oxen are successfully worked in harness like horses, I can say that in Scotland they are so worked, and as the yoke was altogether laid aside before my day, I have heard the old men say that oxen could not do half as much in the yoke as they now do in harness, and as the yoke was never used—in fact it was almost forgotten, as I never saw one till I came to this country nine years ago. A pair of oxen were about equal to a pair of horses for plowing where the soil was hard to plow. The harness was the same as for horses, except that the traces were fastened to the harness several inches above where they are on horses, and an iron halter with a leather headstall in place of a bridle. I have often seen a horse and an ox hitched together to the plow."

Mr. Solon Robinson.—We have had this question under discussion here several times before this, and I hope it will continue to be discussed by all farmers. I do not think they have a more important question, not only in regard to the economy of working oxen or horses, but as to the modes of harnessing them. In this connection I desire to read an excellent article, which I find over the signature of Robert Mansfield, in *The Massachusetts Ploughman:*

"I am surprised that so few oxen are used on the farm. One small school district where 40 years ago, from 12 to 15 oxen were kept, can now produce but one. The same land is thought to be cultivated, but how is it done? Two horses to plow sward land, one to plow old ground. Two good horses, with a modern plow, will break up grass land perhaps, as well as ordinary oxen, but the cost is nearly double. Two horses are worth from $200 to $300, the harness $40 or $50. The keeping of the horses is almost double that of oxen; then there are many days when the team has to be idle. Horses are a total loss, but oxen will always be gaining in flesh. Feed for horses should be compounded from the best of hay and meal, but oxen work and grow fat on poor hay and meal. Corn stover and millet are liked by oxen, but will not agree with horses. There is but one place on the farm where horses are better than oxen—I'm thinking—and that is doubtful. That is to haul the crop of hay to the barn.

"The light work on the farm, such as harrowing out and plowing among the hoed crops, can be done with much less expense with oxen than a horse. It will require some training to make them handy, but it can be all done while performing necessary labor. A yoke of oxen can be trained for this light farm labor, in one-tenth part of the time it takes to train a horse. A yoke of oxen will make one-quarter more furrows in a given time, of this light plowing, than a horse can. If you have a young orchard which you wish to plow, it can be done with more safety by oxen than horses. The whiffletree is the agent that retards the progress of the horse in turning; it is also in such close proximity to every tree that it is attempted to pass, that many of the trees are mutilated beyond recovery. If farming is ever brought to a profitable consistency in this vicinity, oxen will act a prominent part. The annual products of our fresh meadows are used mainly for bedding where only horses are used, but oxen can be kept in good heart, if fed with meadow hay, cut and mixed with meal. This would be a saving of from fifty to a hundred dollars annually on a moderate-sized farm—quite an item.

"This I write, supposing our land to be all rid of stones and other obstructions, such as stumps, miry portions, etc. But when we come to land full of obstructions, the superiority of oxen over horses is too apparent to be overlooked. These hints are from actual experience gathered in the field, and if they serve the purpose of drawing out some of the noted farmers on the comparative merits of the horse and the ox, for farm purposes, the end will be accomplished."

The editor in his remarks says that "his correspondent's hint in regard to the training of oxen to work singly, as in furrowing, deserves the attention of our farmers. There is no reason why an ox may not be handy to work alone in a cart or wagon, or at the plow, harrow, cultivator, etc. We have seen them so working, and if they are trained to step lively, horses would find it difficult to prove more rapid workers, to say nothing of economy in keeping, harnesses, and original cost and final disposal.

"At one of the lake ports a few years ago, upon the arrival of every steamer, a boy might have been seen with a small steer harnessed in a cart, successfully competing with others for the privilege of carrying baggage, freight, &c. Some kind friend had presented him with a calf, which the boy had trained himself, and for several years the labor of the boy and his steer were the full support of a whole family."

In regard to training oxen to a quick gait, the Chairman said it was natural for some cattle to travel as fast as horses. A neighbor of his at Norwalk, Conn., received a present of four head, said to be of the African breed, which were sent to him from Ponce, Porto Rico, where they are used extensively, and travel in a brisk trot, as fast as the ordinary gait of a horse, and faster than the ordinary gait of mules. This breed is very different in appearance from the horned stock which we use. In Connecticut, farmers did not like them, because they looked so odd. Yet I have no doubt they would make valuable workers, being much more quick in their movements than our cattle, and equally docile. The bull was unfortunately killed by two vicious horned animals, so that the breed was not propagated. I believe there is no more difficulty in training oxen to work singly than there is in training horses. I remember an old German doctor, who used to live at Harlem twenty-five years ago, who rode all about the city in a cart to which a bull was harnessed. Sometimes he took his wife and children to meeting in the same vehicle.

Opium Poppy Seed.

Several correspondents are writing to the Club for opium poppy seed, which was promised last year by a Mr. Stark, of Coventryville. If he or any other will forward some to the Secretary for distribution, we suppose several persons will be able to go into the cultivation of this drug.

Great Mortality Among Lambs.

Mr. William W. Dean, Parma, Mich., wants information how to cure a fatal epidemic that prevails among young lambs. Out of twenty dropped this year, seventeen died immediately. "Last year," he says, "I raised thirty-five out of about one hundred. Others have lost as many as one hundred in a season, not raising a single one. The disease is indicated by lumps in the throat. It is not confined to any one farm or vicinity, nor to any particular breed of sheep, neither is it to the lambs alone; I have seen old sheep with lumps in their throats as large as a goose egg on each side. Can any member of your Club give a cause or cure?"

No one present had had any experience in this disease.

Ventilators for Barns.

Mr. Henry P. Peters, Southboro', Mass., in writing to the *Country Gentleman* upon the subject of ventilators for barns, says: "As soon as they were put up the improvement in the air of the barn was immediately noticeable; the rafter and roof boards that were ordinarily damp and sometimes wet from the condensed vapor, were at once dried, and the hay has since been sweeter and more free from must. The expense of these four ventilators, fitted and placed, including the cost of material, was $30; they are much more efficient in their operation than a cupola, as they take the air from four different parts of the barn, while a cupola operates only thoroughly near the center. I am just completing a large barn, on which have been placed three ventilators of this description, each measuring two feet square in the clear; they are made of the best of lumber, and cost, on the barn complete, at this time of high prices, $12 each. In locating them on the building, I placed one on the center of the roof, the other two one-fifth of the length of the barn from either end; this equalizes the ventilation throughout the building.

"I have a barn ninety feet in length, on each side of which cows are tied. I used to be painfully impressed with the unhealthfulness of the atmosphere for man or beast, on going into the barn on a cold winter morning, when all had been tightly closed through the night. Hoping to make an improvement, I caused four boxes, twelve by twenty-four inches, to be carried up on each side of the barn, back of the cattle, against the outside walls. These opened in the floor over the lean-to, and also on the outside of the building, just under the eaves; slides, fitted to the lower opening, regulate the draft. The plan has operated to my entire satisfaction, and with the ventilation in the roof, serves to keep the air always pure, which is no easy matter in a modern barn, containing sixty head of cattle.

"One suggestion more and I have done. Much complaint is made by those having close-sided or clapboarded barns, that the hay lying near the outer walls becomes damp and moldy. I think this may be avoided by nailing strips of board on the studs a few inches apart, which will prevent the hay touching the outside. In my own case, I have, in addition to the strips, an opening in the outer wall, near the sill in each section, six inches square; this creates ventilation and keeps all dry and sweet."

We earnestly commend the above remarks to the attention of every one who owns a barn.

When to Break Prairie.

Mr. Wm. Bliss, Davenport, Ill., says: "With the subject of prairie breaking, that sod may rapidly decay, people differ, but I have learned by an experience of more than forty years that in this latitude between the first of June and tenth of July is the best time. I have examples to prove this."

Mr. Solon Robinson.—I have also had some experience in breaking prairie in every month of the year when the ground was not frozen, and I would rather have one acre broken in June and July than two acres in April and May, and than three acres in October and November. I have seen sod that was turned in November three years afterward unrotted.

Death of Alexander Vattemare.

The Chairman called the attention of the Club to the information just received of the death of this distinguished Frenchman, who was an earnest advocate for improvement, and when he was in this country attended several of our meetings, and manifested an active interest in all that we were doing for the improvement of American agriculture. The death of such a man is a great loss to the world, and is worthy of notice from any body of men with which he has been in any way associated. Gentlemen will recollect him as the person who instituted the system of national exchanges of public documents, maps, books, and historical pictures. The library of this Institute is indebted to him for several valuable works.

Dr. Holton spoke of M. Vattemare as an old and esteemed acquaintance. He knew him in Paris, where he labored eight hours a day for many years in carrying out his great purpose. Many thousands of volumes of public documents, valuable works of the history of the world, which were lying molding upon shelves or in boxes, in libraries or public offices, in all countries, this man had put in motion by his great system of national interchanges. He also alluded to the fact that the idea was first presented to his mind in this country. He came here as a distinguished ventriloquist, and while here made the acquaintance of Josiah Holbrook of Boston, who came to New York in 1836. From Mr. Holbrook he became acquainted with the system which he had originated, of exchanging small cabinets of minerals between the different district schools of the country. He had encouraged a love of study of mineralogy among children, and encouraged them to collect specimens of all the minerals in the vicinity of each. These, with the assistance of their teachers, were properly labeled and sent to other schools, often in distant parts of the country; and this system was undoubtedly the origin of the great geological survey of the State of New York, and perhaps of several other States, to the very great benefit of agriculture in all parts of the country. M. Vattemare saw at once a great utilization of waste material, and immediately set about a still greater utilization, that of the waste literature of the world. This was the origin of his system of national exchanges. It was he who originated the great American Library now open to all our countrymen in Paris. His labors, too, have laid the foundation of many other libraries. He also established schools for the poor in Paris, similar to the Ragged Schools in London or the Industrial Schools in this country. Mr. Holbrook was engaged in the same great work in Boston at an early day; but his energies were mostly devoted to the poor, neglected colored children of that city. Mr. Holbrook lost his life in Virginia about 1854, by a fall while engaged in gathering mineralogical specimens to extend his system of mutual exchanges. The labors of both of these men have done much to advance the cause of science, literature, improvement in agriculture, and to ameliorate the condition of mankind; and they are worthy to have their names honorably mentioned in our meetings, and to be entered upon our records. Their places we cannot expect soon to fill. Let us remember them with respect.

Adjourned. JOHN W. CHAMBERS, *Secretary.*

PROCEEDINGS OF THE POLYTECHNIC ASSOCIATION.

ORGANIZED UNDER THE NAME OF THE MECHANICS' CLUB, MARCH 2, 1854, WHICH NAME WAS CHANGED TO THE POLYTECHNIC ASSOCIATION, MARCH 16, 1859.

RULES ESTABLISHED FOR ITS GOVERNMENT BY THE BOARD OF SCIENCE AND ART.

First. A Club for the promotion of manufactures, arts, and for the discussion of mechanical subjects, is created under the name of the Polytechnic Association.

Second. The Polytechnic association is an agent of the committee of arts and sciences, and is under its entire control, in the same manner as the Farmers' Club is of the committee of agriculture. The transactions of the Association are in the name of the American Institute.

Third. The committee of arts and sciences appoint, annually, the chairman and secretary of the Polytechnic Association. In the absence of the chairman and secretary, persons to supply their places will be chosen at the meetings of the Club.

Fourth. Every member of the American Institute shall become a member of the Polytechnic Association, by signifying his intention to the chairman thereof.

Fifth. The name of any person eminent in practical mechanics, engineering, mathematics, astronomy, chemistry, natural philosophy, social philosophy, geology, mineralogy, practical mining, meteorology, natural history, manufactures or the arts, may be proposed by the members of the Association (by ballot, five-sixths of those present voting affirmatively) to be an honorary member of the Polytechnic Association of the American Institute; and when so proposed, if approved by the committee of manufactures, science and arts, of the American Institute, a certificate of membership shall be issued by said committee.

Sixth. The Chairman of the Polytechnic Association is authorized to arrange sections, or standing committees, embracing all the physical and exact sciences, particularly those named in section second of these rules, and to appoint a committee for each section, who shall report the doings of the sections to the Association. Members, and honorary members, shall be entitled to seats in those sections.

Seventh. Such papers read at the Polytechnic Association as are accepted for that purpose, will be printed under the direction and at the expense of the American Institute, which also provides a place of meeting, lights and fires. No other expenses are to be incurred, except by special appropriation of the American Institute, according to the rules and by-laws; nor any liability incurred by the Institute, except on special resolution.

Eighth. The meetings of the Polytechnic Association are free of all expense to those who attend them.

Ninth. The Polytechnic Association shall select, in advance, a subject for discussion at each of its meetings, which subject shall be announced in the call of meetings.

Tenth. Written communications to the Association are to be read by the secretary, unless objection is made; and if objected to, will be read, if it be ordered by a majority of the members present.

Eleventh. The Polytechnic Association will recommend what papers read before them, or what part of other transactions they judge worthy of publication, to the committee of arts and sciences, by which the publication may be ordered in its discretion.

Twelfth. No person attending the meetings of the Association shall speak more than once on any one subject, nor shall occupy, in such speech, more than fifteen minutes, except by permission of the Association.

Thirteenth. The chairman may invite any person to address the meeting or to participate in the deliberations, but such person, not a member, shall be announced as a visitor.

Fourteenth. Topics presented for consideration, or the announcement of a discovery or invention, improvement or novelty, or the exhibition of any machine or part thereof, or any manufacture or article, must be preceded by a statement setting forth the point, in writing, to be deliberated upon.

Fifteenth. Any person desiring to put on record any supposed or real discovery in science, manufacture or arts, may address a communication to the chairman of the Association, under seal and properly endorsed, which shall be preserved in the archives of the American Institute as evidence for the party depositing the same.

Sixteenth. In all cases not provided for by the rules, Jefferson's Manual shall be taken as a standard.

Seventeenth. The official reports of the meetings of the Association shall lie upon the desk of the recording secretary until 11 o'clock of the day following the meetings, for the inspection of members, and such corrections as are necessary before going to the public press.

Eighteenth. The minutes of the previous meeting shall be read at the opening in order for correction, unless otherwise directed by the meeting.

Nineteenth. No argument is allowed between members. Facts alone are to be stated.

Twentieth. All questions of order are decided, without appeal, by the presiding officer.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
May 7th, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, John W. Chambers.

FIRES FROM SPONTANEOUS COMBUSTION.

The Chairman.—During the past week three fires have occurred, destroying property to the value of $175,000. The first was in the Herald office, which was speedily extinguished; the second was Hay's Candle Factory, and the third was the Erie Railroad Depot at Jersey City. These three fires appear to have originated from the same cause. The one in the Herald office was attributed to the oil rags in the oil room; that in Hay's Candle Factory to grease and wick, and that in the Erie Railroad Depot to the waste used in cleaning the machinery becoming saturated with the oil. The slow combining of the oxygen of the air with oil or fat was no doubt the cause of these fires; in other words, they resulted from spontaneous combustion. Different substances vary in the temperature at which they combine with oxygen; some at the temperature of the air, others at a slight increase of heat, while in some the combination is so slow that no perceptible heat can be produced by it. Another case is when these oils or fats absorb oxygen, and if the oils are under pressure there is an increase of heat; but what accelerates it most is the spreading of the oil over surfaces of fibrous substances. All these cases present the oil in such thin layers that it takes up large quantities of the oxygen of the air, and if there is an increase of heat it will arrive at that point where it will take fire, that is, the oxygen will rapidly unite with the carbon, or burn. We find cases of this kind in the books; an interesting article on this subject in *Silliman's Journal*, enumerates several, which the Secretary will now read.

Mr. Chambers here read extracts from *Silliman's Journal* on Spontaneous Combustion.

The Chairman.—This is certainly a very interesting question, for if in one week a vast amount of property has been destroyed, we can safely say that altogether, many millions have been consumed from this same cause. The subject is also of great importance to insurance companies. Their losses from this cause every year must be immense, and as there is no record of a complete series of experiments to show at what points of heat this combustion takes place, I think it is the duty as well as the interest of the insurance companies to have a thorough scientific investigation made into this matter. The expenditure of five thousand dollars in the employment of competent chemists to experiment with articles liable to spontaneous combustion, would well repay these companies. It is a subject to which the laws of science should be applied, and one in which we are all more or less interested.

Mr. Benjamin Garvey.—It seems to me, Mr. Chairman, so little is known on this subject that is definite, that all our theories are based upon mere conjecture. The theories no doubt are very plausible, we know that no chemical action takes place without oxygen, and that all the combustion which takes place in the air are acts of combinations of the elements of the combustible body with oxygen. But there are other causes to be taken into consideration, which might produce the same result. We know that electricity follows a law very similar, and we may, with the same propriety, ascribe many of the phenomena which take place as due to this cause. Our knowledge, however, on this subject, is very limited, and I mention these ideas in order to direct inquiry to this branch of chemisty.

A specimen of paper made from the poplar wood was presented by Dr. Parmelee.

MANUFACTURE OF SUGAR.

The subject of the meeting—the manufacture of sugar in the North, was announced by the Chairman.

Dr. Dubois D. Parmelee read the following paper on the subject:

We may understand by Sugar, those substances which are susceptible of the vinous fermentation, that is, those which, by a peculiar decomposition, are resolved into alcohol and carbonic acid. These are cane sugar, grape sugar (sugar of starch, of honey, diabetic sugar), sugar of milk, and uncrystalizable sugar.

The "sugar of mushrooms" has been found to be mannite, which is not fermentable.

Cane sugar was probably known to the ancient Greeks, for Dioscorides, in the first century, refers to a concrete honey resembling salt in appearance and brittleness, produced by canes growing in India and Arabia Felix. Pliny records the same fact, but adds that the sugar was only employed in medicine. It scarcely came into use, however, in Europe, till the period of the Crusaders, and not as a common article of food until after the transplantation of the sugar cane from Madeira to the West India Islands, in the year 1506.

In the year 1747, Marggrass, a German chemist, discovered that cane sugar existed ready formed in the roots of many plants, especially in beet root, but nearly fifty years elapsed before any attempt was made to establish a factory for making beet root sugar. This was then done in Silesia, but without much success.

The first energetic impulse was given to the manufacture of beet root sugar by Napoleon. Extensive experiments were made on the cultivation of the beet root, and the best methods of obtaining its juice, and extracting the sugar from it. Factories were set at work under his auspices, and it is represented that the first samples of sugar produced were conveyed at once to the Emperor, who received them with great pleasure, and placed them among the ornaments of his drawing-room.

Sugar, identical with that of the cane, may be obtained from a great variety of plants. It exists in the melon, carrot, pumpkin and turnip, and in the palm, and unripe Indian corn plants, and always as a primary secretion. In Ceylon and elsewhere, it has been prepared from the cocoa nut tree, and other palms.

The yield of sugar varies with the kind of raw material, the nature of the climate and soil in and upon which it is grown, the mode of cultivation, and process of manufacture.

The best canes for sugar are those which have not flowered, or which, on account of some peculiarity of cultivation, show no tendency to flower at all. The part of the cane most rich in sugar is the lower part of the stalk, from which the leaves have dropped off. The stalk contains about half its weight of juice very prone to ferment. It has been often analyzed and found to consist of about 783 parts of water, 208 parts crystallizable sugar, 7·5 of uncrystallizable sugar, 0·07 cerin, 0·25 green wax, 0·4 albumen (=999·27) in 1,000 parts.

In the manufacture of sugar, the first step is to express the juice. As it begins to ferment in a few minutes and to form acetic acid, it must be promptly subjected to evaporation in order to obtain sugar. For this purpose its free acid is first saturated with lime, otherwise the crystallization of the sugar would be interfered with. Other articles are substituted for lime, but none of them have been so effectual as the sulphate of alumina. The juice is next duly concentrated; upon which a crystallization of brownish grains takes place after cooling. These grains constitute the raw sugar of commerce. Six pounds of juice in the East Indies, and eight pounds in the West Indies, yield one pound of raw sugar. This is afterwards purified, chiefly by elutrition with a little water, solution in water heated by steam, clarification with blood and alumina, filtration through animal char. coal, concentration in vacuo at 150 degrees, crystallization, and displacement of the impure syrup in the crystalline mass by passing pure syrup through it. The product is refined sugar.

Chemically pure sugar is snow white, free of odor, and of a density of 1·56. It crystallizes in oblique four-sided prisms, terminated by two converging planes, or derived figures. In this form it contains 5·3 per cent. of water of crystallization. It dissolves in any quantity in water at 212 degrees, and in one-third of its weight of cold water. A heat of about 320 degrees fuses it; and at a red heat it burns with a vivid white flame. When subjected to dry distillation it yields water, pyromusic acid, carbonic acid, and carburetted-hydrogen. It is unalterable by any exposure at the ordinary temperature of the atmosphere. When sugar is melted at 320 degrees, it forms a viscous mass, flowing with difficulty, which solidifies into a transparent mass having a vitreous fracture. This mass, rolled out on marble tables, is sold under the name of *barley sugar* ; in making which confectioners are in the habit of adding a small quantity of vinegar before melting the sugar. Melted sugar kept for some time at a temperature of 356 degrees loses the property of crystallizing when re-dissolved in water; and its constitution is in such case altered.

The composition of crystallized sugar and that of barley sugar, according to Regnault is C_{12}, H_{11}, O_{11}.

The mineral acids, and a greater part of the organic acids, alter cane sugar so that in its chemical properties it nearly resembles fruit sugar. These acids which produce the transformation undergo no change in themselves, but are found intact in the liquor.

Cane sugar combines with bases, and forms, in certain cases, crystallizable compounds, called saccharates.

The presence of sugar prevents the precipitation of several metallic oxides by alkalies.

If sugar is subjected to prolonged action of nitric acid, a great deal of oxalic acid is formed, which is finally converted into carbonic acid.

At the boiling point sugar reduces several metallic salts. It precipitates sub-oxide of copper, (Cu_2 O) from the acetate of copper, and metallic copper from the sulphate and nitrate of this metal ; and it precipitates metallic silver from the solution of nitrate of silver.

Under the influence of yeast, rennet, casein, and protein compounds generally, sugar loses its sweetness, and is transformed into liquid sugar, gum, lactic and butyric acids, mannites, glucose, and ultimately into alcohol and carbonic acid. Each of these transformations is a successive step towards the completion of the fermentation.

The proper proportions to insure a successful fermentation are 1 sugar, 5 water, and 1 yeast, and a temperature 80° to 90°.

The adulterations of sugar are numerous ; but easily detected. The most important sophistications are the admixture of pure sugar with lime, or with the natural impurities which constitute raw sugar. Lime is detected in the solution by a white precipitate being caused by oxalate of ammonia. The admixture of grape sugar with cane sugar may be detected by mixing bichromate of potash with a syrup of the sugar to be examined, and heating the mixture to the boiling point, in a test tube, and then removing from the heat. If the cane sugar is pure a deep green color will appear, especially on dilution with water. Other kinds of sugar remain indifferent to the bichromate; and the presence of starch sugar prevents the production of this green color. Nitrate of cobalt, added to cane sugar alkalized, produces a bluish violet precipitate; but not with an alkalized (potash) grape sugar.

The adulteration of sugar by substances which are insoluble in water, as sand, chalk, etc., are so easily detected as not to require much consideration.

It has been estimated by reliable authority that not less than 40,000,000 pounds of foreign substances are annually mixed with the sugar consumed in Great Britain.

We very seldom think or speak of sugar except in connection with articles of diet and confectionary; but its applications and use in processes of arts are of considerable importance. It would not be easy to find a substitute for the glue and treacle roller employed for inking the types for printing. It is also employed in copy-inks, and for exploding infernal machines, in connection with other ingredients. And when mixed in an iron spatula in the proportions of one part of sugar and three parts of alum, and heated over a fire until perfectly dry and reduced to a blackish carbonaceous substance; then transferred to a retort and heated till a bluish flame appears at the neck of the retort, and thus continued for a quarter of an hour, and allowed to gradually cool, a pyrophorus of very peculiar properties is formed, and which when exposed to air produces intense heat.

Sugar of acid fruits has for its formula C_{12}, H_{12}, O_{12}.

Grape sugar has a formula of C_{12}, H_{12}, O_{12}; when crystalized its formula is C_{12}, H_{14}, O_{14}.

It is the same substance found in dry grapes or raisins, in the form of white grains.

The urine of patients laboring under a peculiar disease called *diabetes*, contains sometimes ten per cent. of sugar, the chemical properties of which are identical with grape sugar. The sugar obtained when starch is boiled with a weak solution of sulphuric acid, and the solution evaporated, after having been saturated with chalk, is identical with grape sugar, but it is generally called *glucose*. The granular sugar found in honey is identical also with grape sugar.

Grape sugar crystalizes with much more difficulty than cane sugar, always producing a compound crystalization; and it is less soluble in water than cane sugar, requiring one and a half parts of cold water to dissolve one part of grape sugar. The sweetening power of grape sugar, compared with cane sugar, is, according to Dumas, as 40 to 100. It dissolves more freely in alcohol than cane sugar, one part dissolving in 60 parts of boiling absolute alcohol. It is completely liquefied at 212° and loses two equivalents of water, and is converted into a new sugar of which the formula is the same as that of fruit sugar, viz: C_{12}, H_{12}, O_{12}.

If slaked lime be poured into a solution of grape sugar, a large quantity of the lime is dissolved, and the liquor first exerts an alkaline reaction, but at a later period becomes neutral and carbonic acid no longer forms a precipitate. The sugar is then converted into a powerful acid called *glucic*, of which the formula is C_8, H_5, O_5, and which forms soluble salts with nearly all the bases.

Glucic acid is also formed when a solution of cane or grape sugar is boiled for a long time with sulphuric or hydrochloric acid.

It was not my intention at the commencement of the arrangement of this paper to add much of any matter purely technical, but following is some information which may not be uninteresting.

The manufacture of grape sugar is a branch of considerable industrial importance, the extent of which and interest attached to it, are, however, very restricted, as it is less applicable to most of the purposes for which sugar is required. It is only capable of being substituted for cane sugar in a very limited number of cases, and will by no means supply its place for sweetening tea, coffee or other alimentary substances, for to render the two kinds upon an equality, in an economical point of view, five pounds of grape sugar should only cost as much as two pounds of cane sugar.

In the production of sugar from starch, on the manufacturing scale, practice has confined itself to the use of sulphuric acid, because it is cheaper, and after having effected its object is easily removed in a short time. As all the varieties of starch are equally adapted for the production of sugar, the cheapest, or potatoe-starch, is only employed. The proportions usually employed are 100 parts of starch, one to two parts of English sulphuric acid, and from 300 to 400 parts of water. The time required for the conversion of the starch into sugar is dependent upon temperature and quantity of sulphuric acid, and therefore ranges from two hours to two days. At high temperature there is great danger of decomposing the sugar also, by increasing the quantity of sulphuric acid. The best temperature ranges from 212° to 219.5° F.

When the starch and sugar manufacture are carried on together, the starch is not dried, but the water which adheres to it is taken into account. The acid is allowed to flow in a small stream into the water, and not the water into the acid; the starch should also be added gradually.

Starch sugar is chiefly employed for the manufacture of alcohol and vinegar, to improve the quality of wines, etc. Many breweries, in France, are connected with factories for the production of starch and sugar, which is added in considerable quantities to their wort. This practice, however, is considered by the English, who are the best judges, to be prejudicial to the flavor of the beer.

In the production of beet root sugar, which is absorbing considerable attention in this country at the present time, the agricultural part of the business seems to require the most consideration. But it is not within the province of this paper, if its limit would permit, to dwell upon it.

From a number of examinations of the sugar beet, the following are the mean quantities of matter constituting it:

96	per cent of juice,	
4	do	albumen, woody fibre and insoluble salts.
100		

Of the 96 per cent. of juice,	10	per cent	is sugar,
	3	do	pectin, soluble salts, etc.,
	83	do	is water.

It is obvious, therefore, that the juice, extracted from the beet for the manufacture of sugar, is not simply a solution of sugar in water, but a solution of soluble constituents of the beet, both organic and inorganic. Two classes of constituents in the juice are great obstacles to the production of crystalizable sugar, and these are the *nitrogenous* and *saline* matters. The former are a source of much injury on account of their changeable nature, producing decomposition in the substances of the juice itself, inducing acidity, which speedily converts cane into grape sugar. It is absolutely necessary to remove them before concentrating the juice. *Clarification* or *defecation* effects this. The mode practiced is to precipitate them chemically and separate them by mechanical decantation. Caustic lime, in the form of "milk of lime" is best adapted for precipitating these foreign matters, but barytes has been used to a considerable extent. The clarification is carried on in a copper pan, heated by a steam jacket rapidly, to the boiling point. The quantity of lime required varies with the nature of the juice, and is determined by preliminary experiment. It is also necessary to test, frequently, as the deterioration of the juice requires an increased quantity of lime. Mr. Ludwig Hacker, in a communication to the *Westliche Post*, of St. Louis, dated April 24th, 1863, states that the best samples of crystalized beet sugar have been made in Saxony, a province of Prussia; and compares the climate of Hungary with the western States, and thinks they are similar; but notes that the frosts, insects, droughts, etc., are serious drawbacks to producing good beets in these States. He thinks small capital should be at first invested in experiments on the adaptability of soil and other conditions requisite for raising the beets, and also in factories located where water is convenient and transportation of the beets can be carried on without too much expense, and fuel, and labor accessible. He thinks that the great failures in Europe have arisen mainly from too expensive preparations of factories, machinery and apparatus adapted to make 100,000 cwt. of sugar, when there were really not beets enough practically accessible, to warrant the expenditure, and pay the great expense attending such outlays. In these cases the engineers have been blamed, new directors appointed, who have spent more money in altering apparatus, which, however, had little to do with the primary difficulty—that of the supply of a good quality of beets.

The company in Illinois have calculated that after paying for the beets, bone, coal, lime and other materials, including press cloth, labor, transportation, tax, interest of capital, the cost of the sugar will be, for a quality equal to the brown Havana cane sugar, 4 cts. per pound.

In Hungary, with large capital, it costs for 112 lbs. of worked up beets, 80 cts.; this yields 8 lbs. of sugar and 4 lbs. of molasses. The remainder is worth about one-fifth of the first cost after deducting the juice, for feed for animals. The molasses and feed is worth 8 cents, leaving for 8 lbs. of sugar 72 cents, equaling 9 cents per pound.

Mr. Hacker thinks that the sugar could not cost more than this estimate in the western States He adds that the yield per acre in Hungary averages 200 cwt. at a cost of $9 to $12; varying with the soil, rain, and extent of culture. In regard to rain, we have more here than there, but summer heat here exceeds that of Hungary. He thinks that from good seed we cannot fail to raise 200 cwt. per acre at a cost not exceeding $12. Every thing required is cheaper here, excepting labor, which is two to three three times higher. The taxes, at the present time, are about the same.

Mr. Hacker has had great opportunities to understand the subject of beet sugar manufacture in Europe from personal observation, and professional interest in the subject. And he was not able to close the somewhat lengthy communication, which I have endeavored to condense here, without repeating the necessity of devoting attention to the cultivation of the beet as the basis upon which all attempts to make this sugar will almost wholly depend.

The Chairman.—Little need be added to the interesting exposition of this subject by Dr. Parmelee. It may assist us in remembering the composition of sugars to say they consist of carbon and water, that is the same elements are contained in each but they are united in a different way. When the sugar is decomposed we find the oxygen united with carbon and not with hydrogen to form a binary compound. Fruit sugar contains 12 atoms each of carbon, hydrogen and oxygen. Yet acetic acid (hydrated) contains four atoms each of carbon, hydrogen and oxygen. Starch contains one atom less of hydrogen and oxygen than is found in cane sugar; that is, $C_{12} H_{10} O_{10}$. There are gums containing the same number of elements as cane sugar. Thus we find substances intensely sour, intensely sweet and neutral to the taste whose composition may be expressed by the same empirical formula. Their peculiarities depend, therefore, on the relative arrangement, rather than the relative number, of the atoms of each element contained in them.

Dr. Rowell.—There are large quantities of maple sugar made at the north every year, but the cheapness of the other sugars offered no inducements to raise the maple extensively. The high price of sugar now will induce the cultivation of the maple in larger quantities than formerly. I have noticed that brown sugar sweetens coffee better than the white, but that it not so good for lemonade or other acidulous liquids.

Dr. Bliss.—The beet is not only valuable for making sugar, but it is also good for domestic use, and as for the crops there is no limit to its growth. I have raised it for several years, and have found it an excellent article of food for horses and cattle generally. Sorghum can also be raised in large quantities on land that will produce very little of other crops. It is surprising to see how much can be cultivated in soil of value for no other purpose.

Mr. J. Bull.—I have no doubt but that the consumption of maple sugar is very much on the increase in this country. I supposed that sorghum was to take the place of the sugar that we got from Louisiana and foreign ports, and I have been informed that experiments are making with this article that promise very favorable results. Necessity is the mother of invention, and where there is a great want there is always a great effort to supply it. It is my opinion that cotton will be raised in the free states in quantities that we little dream of. There is land enough and free white labor enough to furnish the loyal states with nearly all they want of both sugar and cotton.

The manufacture of sugar at the north was continued for discussion at the next meeting.

Adjourned.

American Institute, Polytechnic Association,
May 14, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. John W. Chambers.

During the time devoted to miscellaneous business the first subject presented was

Cannon.

Mr. Rowell.—During the past week I have seen an account of some experiments made at the English Naval Depot, at Woolwich, with guns, by using balls of different weights. They first tried a six pound breech loader, and after firing six rounds they increased the quantity of powder to the service charge, after that they gradually increased the weights of the balls, until they fired one weighing 200 pounds. This ball filled the whole bore of the gun, and projected from the muzzle some distance. This would seem to set aside the theory of Mr. Wiard, that the bursting of a gun is occasioned by its thermal condition. Another gun was also tried of larger calibre, from which, by increasing the weights of the ball they eventually fired a steel shot weighing 1,000 pounds, so that it seems there is a gun made to stand the fire of a thousand pound ball.

City Locomotives or Steam Cars.

Mr. I. K. Fisher.—I have examined some of the city locomotives or dummys, as they are called, used for propelling cars on city railroads, now running from Jersey city to Bergen Point, and about which considerable has been said lately. I did not find anything very new in them to report. They are but littte different from the usual class of dummy engines which were used on the Hudson River Railroad. The cylinders are large, and the steam expanded to low pressure; the chimneys are double, and an inch and a half of sand placed between, which deadens the noise of the exhaust steam. They run about eleven miles per hour, and the jolting at that speed is not much greater than in the ordinary cars drawn by horses. On inquiring as to the expense of running these engines, I was informed by the superintendent that they can be run a third cheaper than horses at an average speed of nine miles an hour. I consider they are superior to horse power, even if they do not have a greater speed than that of horses. I have watched very carefully to see if horses were frightened by them, and I have seen only a few that were so, and I am satisfied that if they were in general use horses would become used to them. I have expressed my opinion against gearing on this class of engines. I see no reason why it should be used particularly on driving wheels of thirty inches diameter. These engines have gearing, so that the piston makes two strokes to one revolution of the driving wheels. I deem it proper to say that in my opinion our city rail cars are the worst vehicles we have. The pitching and jolting in them is often worse than in the stages, far worse than in stages on the Belgian pavement. Improvement is certainly needed in this respect. I consider much of the fault to lie in having loose axles, that is, the play, as it is termed, between the axles and the boxes, which in some cases is over a quarter of an inch. Steam cars are, however, superior to horse cars, and more comfortable; and I was surprised to hear from the superintendent the low cost of their running. I have no doubt but tha they will be reduced to a third of the present cost when they are in more general use. There are places where they could run very fast, and this saving of time is worth a cent per minute, so that the saving in a daily travel of seven or eight miles would be considerable in a year.

Mr. J. Bull.—While I agree with Mr. Fisher, and hope that the time is not far distant when city railroads will come into general use, yet I cannot agree with him when he says that city railroad cars are more uncomfortable than stages, as I am in the habit of walking some six or seven blocks to the cars every day in preference to the stages close by.

EXPLOSION OF A CASTING.

Mr. James L. Jackson.—Some fifteen years ago I had a casting made of the figure of Mercury. It was cast with a core, and put into vitriol to remove the sand from the outside. The core was never removed, but the opening to the core was plugged up. I had it made as an ornament for Dr. Nott's stove. I found that it would absorb moisture through this plug, and when the figure on the stove would become hot, it would exude from the plug. This figure, I believe, was blackened with varnish twice. Recently I was doing some work for a gentleman from St. Domingo, and he took a fancy to this figure, when I made him a present of it, and had it removed and sent down to be varnished. While this was being done it suddenly exploded, and came very near killing those around at the time. The best explanation I could give of the cause of this accident was that the core absorbed some of the vitriol, and this formed a gas which gradually increased and finally exploded. At the time it exploded it had not been warm enough to burn the varnish, which was made of oil. The plug was put in at the time it was made, some fifteen or sixteen years ago. As this explosion was somewhat singular, I thought it worth mentioning, as it shows us that we are never out of danger.

Mr. Dibben.—I do not think that there can be any doubt but that it was the pressure of the steam and not a gas that produced this effect.

The Chairman announced the subject for the evening, the continuation of the discussion of the "Manufacture of Sugar in the North," when Mr. John W. Chambers read the following paper:

PRODUCTION OF SUGAR AT THE NORTH.

No time in the history of the United States will be hailed with more generous welcome than the present for the introduction of any new sugar producing plant.

Sugar has become so generally an actual necessity of life, and the number of consumers is increasing in such an accelerated ratio, as to cause the demand by far to exceed the supply. Notwithstanding the large quantity of sugar and molasses produced in the United States a large amount is obtained from abroad. The sum paid for imported sugars in 1859 exceeded thirty-one millions of dollars, and in the same season thirty millions of gallons of molasses were imported.

The following table shows the quantity of sugar, molasses and honey produced in the United States in 1860.

Cane sugar, pounds	302,205,000
Cane molasses, gallons	16,337,080
Sorghum molasses, gallons	7,235,025
Maple sugar, pounds	38,863,884
Maple molasses, gallons	1,944,594
Honey, pounds	25,028,991

The rapidly increasing culture of the Chinese sugar cane is supplying a great want. From a remote period sorghum has been cultivated in Egypt and India as a forage plant, and as food for animals and man. In 1786 Signor Pietro Arduino of Florence, attempted to introduce the Imphee from Caffraria into Italy, for the purpose of making sugar, but doubts exist whether the plants on which he experimented were the same as the sorgho introduced from China, for he speaks of the seeds being of a clear light brown color while the seeds of our Chinese variety are of a very deep purple almost black. His description nevertheless exactly corresponds with the appearance of the seeds of Mr. Wray's Imphee, and we are led to believe that it was in reality the African, and not the Chinese sugar cane which was cultivated by him at Florence.

It is now generally understood by botanists that the sorgho and imphee are not different varieties of the same plant but two different species.

The first appearance of the sorgho in Europe dates back no further than the year 1851, at which time the Count de Montigny, being Consul of France at Shanghai in China, sent, in compliance with official request, a collection of plants and seeds which he found in China and which he thought would succeed in his own country, among which was the *Holcus Saccharatus*, under the name of the sugar cane of the north of China. The first introduction of the sorgho into America was made by D. Jay Brown, Esq., a member of this Institute, then employed in the Agricultural Department of the U. S. Patent Office at Washington. On his return from Europe in 1854, where he had been sent to purchase seeds, he brought with him a quantity of the seed of the Chinese sugar cane, which he had procured from M. Vilmorin, a celebrated seedsman of Paris; and soon after other patriotic citizens imported large quantities of the seed for distribution; but the feeling of suspicion with which all new seeds are more or less viewed tended to confine the experiment of its cultivation to a few enterprising farmers of our country.

The chief clerk of the new department of agriculture at Washington (Mr. McCormick) attended a meeting of the Farmers' Club a few weeks since, stating that from statistics received by the department the amount of sorghum molasses made from the crop of 1862 would not fall short of forty millions of gallons.

The imphee before mentioned was introduced by Mr. Leonard Wray, an English gentleman, well known by sugar planters as the author of several works on sugar planting.

In 1850 he left the East Indies for the Cape of Good Hope, whence he went to Kaffirland, and found the Zulu Kaffirs cultivating the imphee around their huts, not for the purpose of manufacturing crystalized sugar, or obtaining any other of its products with a commercial view, but merely for the purpose of chewing and sucking the stalk. He quickly saw of what value such plants were likely to become to Europe and America, and applied himself to their study, their culture and manufacture into sugar, &c.

While in this country Mr. Wray was constantly at our rooms, and made some interesting remarks in relation to its growth. Mr. Wray discovered among the Kaffirs sixteen distinct kinds of imphee of various degrees of saccharine richness, and differing very widely in the time required for their maturity.

There is no lack of plants from which sugar may be made. Indian corn, the rock maple and some other trees, the beet root and sundry other esculents, and lately we have seen sugar made from the juice of the box elder.

Mr. Wray compares the value of the imphee with the beet, as follows:

IMPHEE.—Time of growth from three to four months; sugar, per acre, 3,000 lbs; molasses equal to cane molasses.

BEET ROOT.—Time of growth from seven to eight months; sugar, per acre, 1,000 lbs; molasses very inferior.

"This, too, is on the broad supposition that the value of the molasses, fodder, &c., of the one, equals that of the other. I venture to say that the comparative value is so entirely in favor of the former, that the beet root culture will gradually be relinquished until it becomes at length totally neglected."

The total amount of maple sugar made in 1850 was 34,253,436 pounds; in 1860, the product was 38,863,884 pounds. This increase is not large, but sufficient to afford gratifying evidence that our beautiful maple groves and forests are not becoming extinct, while many are preserved with commendable care. We wish it could, with truth, be added, that the cultivation of this noble tree was extending in an equal ratio; equal, because the old trees in the forest are diminishing, under bad treatment and the demands for new lands for tillage. The landholder who appropriates a few rods of land for the preservation or cultivation of the sugar maple tree, not only increases the value of the estate, but confers a benefit upon future generations.

Of the 38,863,884 pounds of maple sugar produced in 1860,—

New York made	10,816,458	pounds.
Vermont made	9,819,939	do
Ohio made	3,323,942	do
Michigan made	2,988,018	do
Pennsylvania made	2,768,965	do
New Hampshire made	2,255,012	do
Wisconsin made	1,584,406	do
Indiana made	1,515,594	do
Massachusetts made	1,006,078	do
Total	36,078,512	pounds.

Mr. Rowell.—I have seen it stated that Indian corn was a very good article for making sugar, and that more sugar could be made from it than from any other kind of grain.

Mr. John P. Veeder.—It was Prof. Mapes who advocated the use of Indian corn for making sugar. He said it would make a better article of sugar than any other of the substances generally used. An objection to the Indian corn is, that it does not grow high enough; but this objection can be removed if it is not allowed to bear grain. I have had the Tuscarora corn grow twelve feet high. The leaves would also be good for fodder, and it could be planted closer together than at present. It is now planted three and four feet apart. Maple sugar is very pleasant to the taste, but it is not so well adapted for domestic use as the cane. Honey answers better for this purpose. The growth of the maple tree is prevented when we draw the sap from it, so that we could not depend on it for a regular supply.

The Chairman.—A peculiarity of honey is, that it contains both grape and cane sugars. In France, they made sugar from the beet root to a great extent, but they found that they lost very much by it. One of the French princes, during a tour through France, was presented by the people with a beet draped in mourning. Having the experience of France before us, the question to be considered is, whether it would be profitable to engage in its manufacture in this country.

Dr. R. P. Stevens.—The capacity of the beet to make sugar has been largely increased by improving the seed, so that the yield is some threefold. Some varieties are better than the cane. It also gives an increased value to the land, by improving the soil; and, although it has been a source of expense to France, yet, by the increased fertility it gives to the land, it will eventually prove a great source of economy. In regard to the raising of maple sugar, I would say that there are now large tracts of country in New England, Pennsylvania and New York, where the trees have been cut off, for lumbering purposes, that are now lying waste. These tracts are well adapted for growing the maple tree, which, with little labor, could be made available for this purpose; and when the trees became exhausted, the dead timber could be cut down and made into charcoal, which would be valuable in this condition. Charcoal, made from hardwood, is, at present, a great desideratum, as the supply for the manufacture of charcoal-iron is extremely limited. This is a great want, which dead maple timber could supply; and, unless something is done in this respect, we will have to look for our best pig-iron to other sources. The Lake Superior blast furnaces have had to stop the manufacture of iron for the want of charcoal. If maple trees were now planted in this barren waste, in twenty-five or thirty years they could be tapped for maple sugar; and, when exhausted, they would still be valuable in making charcoal for the manufacture of that great staple in which our country so much abounds.

Mr. John P. Veeder.—To make the maple tree available for maple sugar, will require at least twenty years' growth. Twenty-two years ago I planted maple trees, and they are now but four inches diameter; they should be six inches diameter before tapping, for, when they are tapped, they stop growing. From this we will see that the maple is rather a slow growing tree. The silver abele will grow ten times as fast as the maple. The elm is also a quick growing tree. These I consider superior to the maple, especially by their rapid growth. If we want hard wood for charcoal purposes, the growing of the maple I consider unprofitable, from the long time it takes to arrive at maturity; and when it does mature, we commence to kill it by tapping. For charcoal, as I have said, we have other trees that grow much faster. On the whole, I would not advise its extensive cultivation. If I had a large forest of trees and intended to destroy them, I should not hesitate to tap them. I certainly should take away their strength. I should also consider it unwise to go in to this sugar business singly. It should be done on a large scale. Companies of the farmers should be formed, and they should concentrate their efforts in order to make it profitable. This Institute might be the source of valuable information to them. And now, since the Transactions of the Institute are to be placed in every school district in the State, it is very important that we should furnish them with the results of experiments, and thus save them from embarking in useless and unprofitable undertakings.

The Chairman.—It is well known that the chemist can make sugar from saw dust by means of sulphuric acid; and there are various other substances from which it can be made. Doubtless, a practical application of scientific knowledge in the selection and use of new substitutes for the cane will lead to very important results. It is desirable every farmer should understand whether it is best to boil the syrup and make the sugar on the farm or send the liquid product to the manufacturer.

Mr. Dibbin.—I consider the best way for the farmer is to sell his syrup to the manufacturer, and avoid purchasing those machines that are so numerous in the country for making sugar. It can be done better and cheaper by the regular sugar maker, as is manifest when we consider the facility and reduced cost at which articles can be manufactured on a large scale.

Dr. Rowell.—The wood that grows very rapidly makes a very poor charcoal. The maple, being a hard wood, is valuable for this purpose.

Mr. Veeder.—Some of the softer woods, such as the Lombardy poplar and the ash, make a very good charcoal.

Mr. Rosevelt.—In France they use charcoal not much thicker than the finger, made of hard branches, and it is considered very good.

At the suggestion of the chairman, the subject of Horology was selected for discussion for the next meeting.

Adjourned.

American Institute Polytechnic Association,
May 21*st*, 1863.

Chairman, S. D. Tillman, Esq; Secretary, Mr. John W. Chambers.

Root's New Steam Engine.

Mr. John B. Root presented a model of his new duplicate steam engine, a working model of which is in operation at the works of Mr. J. L. Jackson, 28th street, N. Y. Mr. Root made drawings on the blackboard, showing its peculiar structure. It has two rectangular pistons working at right angles. The inventor showed the mode of reversing. The steam can be cut off at half stroke, and the exhaust kept open until the end of the stroke, After being a little used, and the surfaces get to a bearing, the wear is very little, and it does not seem to be affected by expansion, as all the parts are heated alike, and not like other rotary engines, where the steam acts only on one part at a time, which causes unequal expansion, and consequently great friction and unequal wear.

Mr. Rowell.—I have seen this engine at work, and it ran very smoothly, and appeared to work remarkably well. It appears to be a perfect machine. The engine was slowed so that I could listen to the exhausts, and it appeared to work perfectly.

Mr. Joseph Dixon.—I would like to remark, in confirmation of what has been said, that I saw this machine in operation for half an hour, and it worked very beautifully and smooth. The speed was increased very high, and then slowed so that I could hardly see it move. The exhaust was clear, and I could not perceive any noise, and I concluded that it worked very perfectly. What a further investigation would elicit I do not know; but at present I think this engine will take a high place among those of its class.

The Chairman.—This is the only novel steam engine, of any importance, which has appeared for the last few years. It has the advantage of two cylinders and pistons, working at right angles on the crank, as on the common locomotive, yet the whole is one case. It is remarkably compact, and requires no balance wheel. The pistons are necessarily rectangular, and the power is applied very close to the shaft. The wear of the engine must be determined by use. With regard to its adaptability to many places where comparatively small power is required, there can be no question.

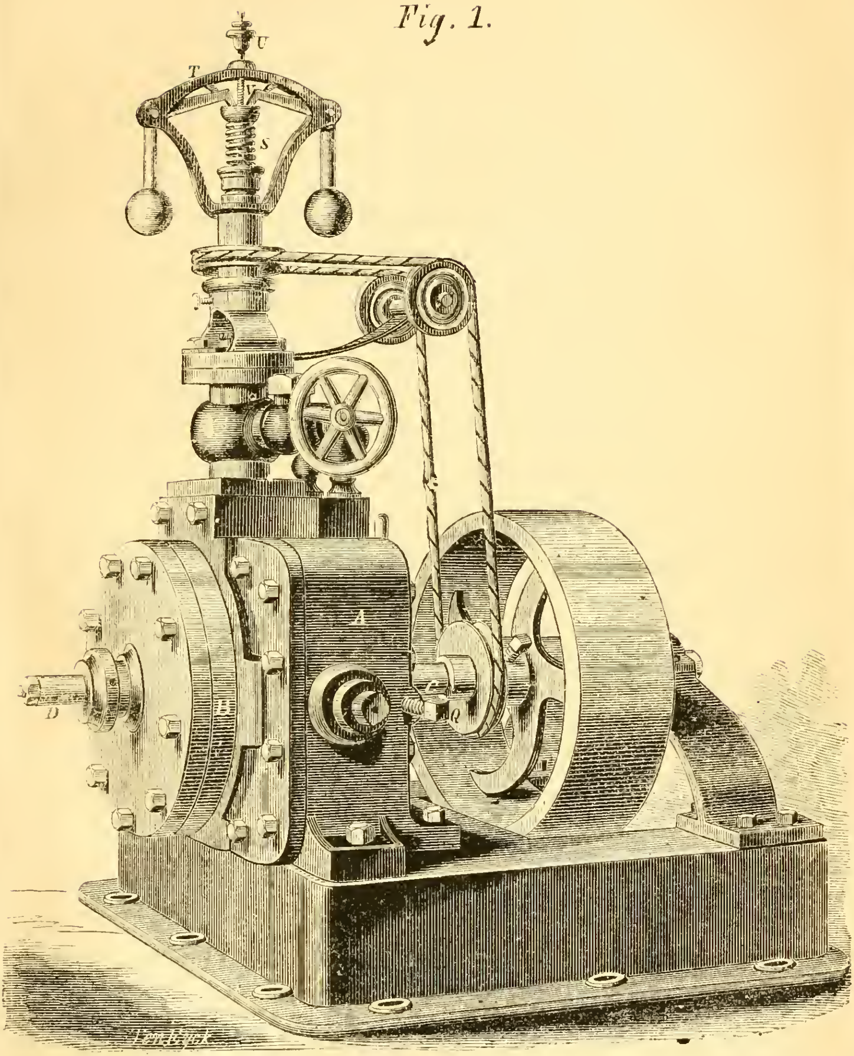
Dr. Rowell.—In regard to the wear of rectangular pistons, it may be remarked that slide valves, some of which are four or five feet area, wear very even, and keep tight for a long time.

Mr. Root.—In figure 1 we have a perspective view from the valve chest side. In this figure, A is the case, or what may be called the cylinder, and B is the valve chest; C is the main shaft, and D is the valve stem, which has a rotary motion; the other external parts are not peculiar, with the exception of the governor, which is. In figure 2 we have given a side elevation of the steam cylinder, A, with the valve face removed.

This valve and face is shown in figure 3, while the piston and its crank shaft are depicted in figures 4 and 5; thus the main parts, constituting nearly the whole engine, are presented in this number.

In figure 2, E is one piston and F is the other; they are both right-angled and parallelograms in shape; the inner one, F, is hung directly on the crank pin, and slides up and down in the other one; it will thus be seen that one piston has a vertical motion, while the other works horizontally. Steam is admitted to both these pistons at once through the openings in the valve face, and clearance is given in the cylinder, as shown at G; the openings, H, are for the four exhausts. These exhaust and steam passages are shown clearly in figure 3; in it the valve face is marked I, and the steam ports G; the exhaust, H. These latter, where they issue from the annular passage common to the whole, are shown in dotted lines; from these the steam passes into the cylinder which is cored out all around, so that the exhaust steam may be taken out at either of the two points closed by the screw plugs shown in the engravings. The valve itself is a simple metallic ring, shown isolated, at K, figure 3; the central orifice fits the eccentric, L, and this eccentric is driven by the stud on the end of the crank pin, so

Fig. 1.



Root's Novel Rreciprocating Steam Engine.

Fig. 2

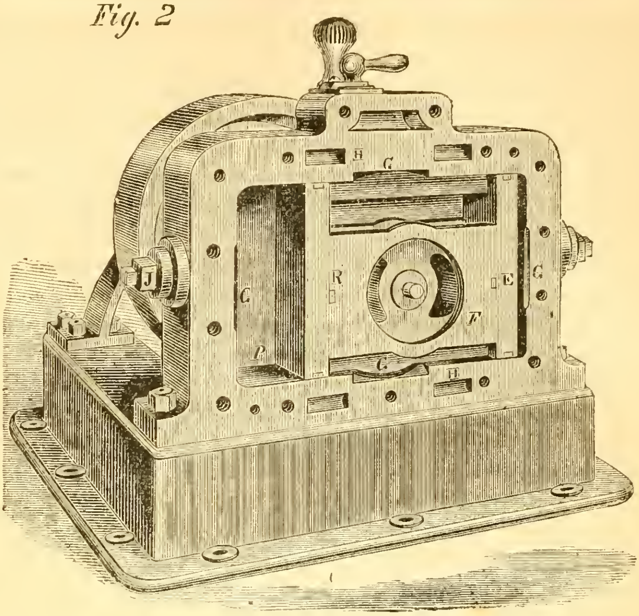


Fig. 3.

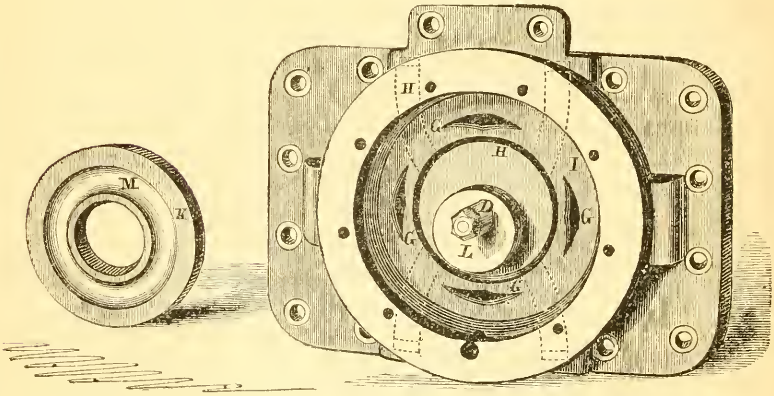


Fig. 4

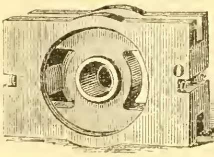
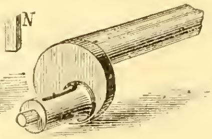


Fig. 5



that when the shaft is turned around, the valve has an epycycloidal movement over the valve face, opening and closing each port alternately in its passage. This is a very beautiful movement, and permits the lead on each piston to be adjusted to any required degree of nicety. The hollow M, in the under side of the valve, is the exhaust passage.

The packing of these pistons is a very simple point, and yet with all its simplicity it is perfectly performed. We are assured that no leakage whatever is visible in the engine when at work. In figure 4, where the piston is shown separately, the packing is also shown, and requires but little explanation; the mechanical reader can see that the steel bar N, fits in the slot, O, and is forced out by the spiral springs placed therein. There is also a side plate, which is shown at P, in figure 2; this is forced inward by wedges behind it, the wedges themselves being attached to a frame which is worked by the set-screw, Q. This plate in connection with the packing, R, makes the pistons perfectly steam-tight against the cylinder cover, and yet easy working in all of their parts.

In figures 4 and 5, the inner piston, or one on the crank-pin which is of the same area, however, on its steam face as the external one, and the crank shaft, are shown detached. The pistons waste little or no steam at the completion of their stroke, as they work snugly up to each other, and to the cylinder. There are no projecting bolt heads, and the steam ports open directly on to the pistons, thus preventing the waste of steam which occurs when long ports have to be filled with live steam at every stroke. It is difficult to conceive of a more compact or efficient steam engine than this in the same space. There are no "centers" or "dead-points" to the crank, as each piston moves the crank alternately through one-half of its circle, consequently there is never that mechanical loss which is experienced in ordinary single engines between the times of shutting off the steam during one stroke and opening the valve for another. In this engine, we have always nearly an equal pressure upon the crank, depending, however, wholly upon the distance to which the live steam follows before it is shut off. The speed of the piston in feet is not great as the stroke is so short, but the engines run at an average rate of 150 revolutions per minute.

One of these engines is now working a pile-driver in this city. It raises 2,240 pounds (or one ton) 36 feet in 6 seconds; taking 33,000 pounds raised one foot in a minute as a standard-horse power, the engine in question develops over 22 horse-power; for 33,000 pounds raised one foot in one minute are equal to 550 pounds raised one foot in a second; and 2,200 pounds raised 36 feet in 6 seconds are equivalent to 360 pounds in one second. One-fifth of 550=110 pounds, and three-fifths=330 pounds, or three-fifths of a horse-power for every foot of distance. The whole distance being 36 feet, it is easy to see that by this rule this engine has a power exceeding 22 horses, minus friction. The pistons are 56 inches area by 5 inches stroke.

The governor of this engine is peculiar, and constructed on proper principles, as it is obvious that if the arms of the governor hang vertically and are formed at right angles with each other, the movements are positive' and no loss is experienced as is the case with the old-fashioned regulator, where the balls move perceptibly before the throttle valve is changed.

This governor runs at a high speed, and has a short screw-rod at the top which connects with the valve in the chest below ; there is also another nut for altering the tension of the spiral spring, S. These nuts enable the speed of the engine to be easily controlled ; for by running the nut, U, up or down on the rod, V, the spring is relaxed, or set up so that more centrifugal force is required to affect the balls, and the speed of the engine increases to make up this force ; when the spring is relaxed, the reverse occurs. The governor-valve, in the chest before spoken of, is also changed in its position in a manner not necessary to describe at present.

Horology.

The Chairman opened the subject for the evening's discussion by remarking that the word Horology is derived from the Latin *horologium*, and originally from two Greek words meaning "to tell the hour." Among the ancients the art of measuring time was quite imperfect. The oldest instrument we have any account of, was the Clepsydra. This name is derived from two Greek words signifying "the stealing away of water," and has reference to the gradual and almost imperceptible manner in which the water moves in the Clepsydra. There were several varieties of this water clock used in Chaldea, India, and China. The most common device consisted of a vessel, on the side of which was marked at regular intervals, the number of the hour. Into this a stream of water of uniform size and velocity was discharged, and as the vessel filled the height of the water in it indicated the time. It is apparent that there was some difficulty in securing uniformity to the inflowing stream ; this was doubtless obviated by having the stream issue from an orifice, near the bottom of a second vessel, which was kept constantly full to overflowing. If the hours were marked by the emptying of a full vessel by means of an orifice at the bottom, the graduation would require constantly increasing intervals from the top to the bottom, the height of water in the vessel being directly as the square of the velocity of discharge. The sun-dial, used at a later period, had the advantage of correctness, but is available only during that small portion of time, when it receives the direct rays of the sun. There are many forms of dials, that in most common use and in our day occasionally placed in pleasure grounds and gardens, is a horizontal disk on which is a perpendicular gnomon in a line parallel with the axis of the earth.

Another rude method of measuring time came into use after the invention of candles ; it was a simple graduation of the candle into spaces corresponding with the length consumed in a given period. The hour or sand-glass is another old device, and is preferable to the Clepsydra because the pressure of sand at the orifice of discharge does not depend on its height as is the case with water. It consists of a frame holding two glass cones placed apex to apex in the same right line, and having a small passage connecting them. It contains sand sufficient to fill one cone, which is discharged by gravity into the cone below, in a given time. A very neat little sand-glass requiring about three minutes for the discharge of its sand is in common use to regulate the time for boiling eggs. All these devices however sink into insignificance when compared with the modern mechanism for measuring time.

The principal parts of the clock and watch are—

1st. The motive power, called in this case the maintaining power, which is either a weight or spring.

2d. Either the pendulum or the balance wheel.

3d. The escapement.

4th. The wheel work connected with the three hands.

5th. The retaining power used during the process of winding up. These parts are essential to every time-piece; to these may be added—

6th. The striking apparatus, which is motion at fixed periods, and the repeating apparatus which is put in motion at will and gives any moment the hours and quarters that have past.

7th. The alarm attachment which can be fixed in advance to give an alarm at any appointed time.

Leaving it to others present to discuss these parts in detail your attention is now directed for a moment to the pendulum. To Gallileo, we are indebted for the discovery and practical application of its peculiar property called isochronism, or the disposition to vibrate in different arcs in very nearly the same time. It was said he was led to the investigation by watching the swinging of a chandelier, hung by a long chain from the roof of a church in Florence. But the celebrated Dutch philosopher Huyghens, first demonstrated mathematically that if a weight sustained by a string or rod describe a cycloid, its vibrations, however large or small, would be performed in the same time. Attempts were made to give this motion to the pendulum of a clock, but they were not successful, and it was soon found that if the pendulum was allowed to describe a very small arc the error would be quite small and would be partly remedied by the spring which usually sustains the pendulum. It will be remembered that the time of its vibration is proportional to the square root of its length. A two seconds pendulum being four times as long as a second pendulum. This relation is expressed by the formula

$$t = \pi\sqrt{\frac{l}{g}};$$

t being the time in seconds; π, the ratio of the circumference to the diameter, or 3.14159 to 1; l, the length of the pendulum, and g the force of gravity in the latitude where the pendulum is to vibrate. The regulation of the length of the pendulum is by a nut and screw, on the rod below the weight or bob, and upon which it rests. It was early discovered that clocks gained time in cold weather and lost time in hot weather, owing to the contraction and expansion of the pendulum rod. Many devices have been made to remedy this defect; one is a weight of lead whose length greatly exceeds its diameter sustained by a wooden rod at the bottom so that while the wood expanded and made the weights slightly lower, the lead expanded several times more in proportion and thus kept the centre of gravity at its proper position. Wood is affected less by temperature and more by moisture, which is a serious objection. The two best pendulums are known as the mercury weight and the compensation bars or gridiron rod. The principle of compensation is the same in both; while the rod is moved downward the mercury is moved upward. The compound rod is usually made with zinc and iron alternately riveted together at their ends. Two rods of iron acting downward and one rod of zinc upward, provided the expansion of the zinc was double that of the iron, would equalize this action by heat and cold.

The manner and methods of making watches have so improved within the last 25 years that their cost has been materially reduced, and the divisions of time have been carried to quarter seconds with great exactness. Such time-pieces have had the effect of making all our calculations of time more close and exact. Now we state the time of a race to the parts of a second. This exactness of measurement, by means of the electric telegraph, was first used and with complete success in astronomical operations, by the late Dr. Locke, of Cincinnati. The late lamented Brig. Gen. Mitchell, many will recollect, lectured in this city on this subject, and explained what he called the personal equation, it having been found that the time of seeing and recording, or in other words the time of the passage of thought from the brain to the hand, was not the same in any two persons. This subject of Horology has not yet been fairly and fully discussed in this country, and I hope we will continue it till we are thoroughly acquainted with what has been done. Over 100 different escapements have been invented and used in clocks and watches; and this topic alone would interest an audience an entire evening.

Prof. Everett.—I have seen it stated that the American watches are made with a more powerful spring; so much so, that they are liable to wear out very soon; and that the power of the spring covers up any fault that may be in the watch. I would inquire if this is so?

Mr. Bradley.—The springs of American watches are no stronger than those of foreign watches. The main-springs are all alike as regards strength.

Mr. I. G. Chislom.—As American watches are made without the fusee and chain, I would like to inquire in what way the unequal pressure of this spring is overcome?

Mr. Bradley.—It was supposed that this could not be done without the fusee and chain, and the English still adhere to this opinion; but experience has proved that watches can be made to run with regularity without the fusee, and this is done by a very quick movement. It will be observed that the balance wheel in these watches moves very fast; the American watches, with no fusee, drum or chain, has fewer parts, less friction, and is not so likely to get out of order as the European, and when broken can be more easily repaired.

Mr. J. Dixon.—There was a very curious clock made in 1822 and 1823, by Harrison G. Dyer, now I believe of this city. He made several of these clocks, some with one wheel, others with two. The one wheel clock, with one winding, would run one day, and that with two wheels, eight days; and he made one that would run a year. Mr. Bogardus, a member of this Institute, made a clock which has been running twenty-five years; it has but three wheels, and during all this time has been oiled but once.

The Chairman.—It is very interesting to look over the accounts of the various movements that have been invented for recording time. That of

Mr. Dyer's is the most original piece of gearing made in our day, and it was made by an American. The teeth of the large wheel fit into a spiral grooved stem, so that one tooth effects one revolution of the stem. The only objection to it is the end pressure, which causes most of the friction on one part, and it is liable to wear out there. In this country it may be said that every man can carry a watch. I remember several years ago, being in a small town in the interior of this State, when one evening watches became the subject of conversation, and a calculation was made as to the value of the gold watches owned by the inhabitants, when it was ascertained that the value of those known to persons present amounted to ten thousand dollars. The watch business of the United States is immense, and very few are aware of its great extent.

Mr. John W. Chambers read the following article on American watches, from the *N. Y. Tribune:*

THE AMERICAN WATCH COMPANY.

Watches, which were formerly but the decorations of the opulent, have become the common necessity of the many. The subdivisions of modern labor involve accurate subdivisions of time, and the merchant, the artisan, the professional man, even the lounger, must be able to summon from his fob at will the instrument which points the hour. This is the age of exactitudes. Every one of this busy generation must know, a dozen times a day, precisely where he stands chronologically. The note, for instance, must be met by 3 P. M. The difference between that hour and the fraction of a minute later is the difference between untainted commercial repute and damaged credit. The cars start at six. Unless the watch be at hand to admonish the traveler, he reaches the station breathless, in a state of eager perspiration, just in time to see the exasperating train driving away under a full press of steam. A thousand times between sun and sun is felt the need of consultation with the patient little familiar which, hived in the waistcoat pocket, ticks away unceasingly as the hours of all the days traverse its dial. The fact that it has become so general a necessity gives importance to the circumstance that we are no longer dependent upon a foreign market for a supply, and that to American ingenuity, aided by American capital and American enterprise, we are indebted for the ample and constant production of watches which in all respects are equal and in many important particulars superior to the best articles of European manufacture. The American watch company of Waltham, Massachusetts, established in 1850, has grown into proportions which entitle it to a first rank among the manufacturing enterprises of America. It employs between 400 and 500 artisans, and produces an aggregate of nearly 50,000 watches per annum. The quality of these instruments has been thoroughly tested by minute comparisons, and the result is decidedly in favor of the home-made over the imported article. The principal difference arises from the mode of manufacture. Foreign watches are made principally by hand, and finished one at a time. All these mysterious and infinitesimal organs which, when aggregated, produce the watch, are the fruit of slow and toilsome manual processes. In the results there must of course be lack of uniformity. The constituent parts of the American watch are fashioned by machinery. Wheels, pinions, springs, screws, absolutely uniform in weight, circumference, dimensions, and in every possible particular, are turned out in myriads by unerring iron hands. The difficulty of manufacturing by hand such trivial miracles of metal must be evident. It involves such digital cunning, such superlative acuteness of eye, such unnatural patience of effort, that it is almost a wonder how the workshops of Geneva and La Chaux de Fonds continue to replenish their armies of operators. But in the Waltham manufactory these delicate particles are produced by machinery. For example, a coil of fine wire weighing a pound is divided and worked out into some 100,000 screws, each the counterpart of every other, and a curious fact in relation to this magical transformation is, that the cost of the wire before it enters the machine is about five dollars, and that when it emerges, its product is valued at $3,500. The exquisitely finished, though almost invisible particles, are put away in tiny glass vials like those in which physicians carry the pellets wherewith they exasperate the intestines of men. The wheels and pivots are created by similar methods. The jewels likewise are drilled by unerring machinery. Scarcely larger than grains of sand, they must yet each be probed with a clean round orifice to admit the dainty shaft upon which the wheels of the watch revolve. This is accomplished by means of drills so delicate that they almost elude the unfamiliar vision. They are as fine as the filaments of a spider's web, yet so strong and hard that they tunnel out these Lilliputian crystals with the swiftest precision. With equal regularity and uniformity the process continues to the end. After the hole is bored its interior is subjected to a perfect polish, which is imparted by rapidly revolving drills fed with diamond dust. The jewel is then ready to take its place in the watch, the correctness of its aperture being measured by gauges so delicate as to indicate the ten thousandth part of an inch. After such or similar adjustment, the various parts are all divided into classes, each bearing an unvarying relation to the rest. As one practical and easily appreciated result of this perfect correspondence, it may be instanced that the owner of a watch of which by accident any part gets lost or injured has but to address the company, inclosing the number of his watch, and stating the organ wanted, screw, wheel, jewel, spring, or what not, and forthwith by return mail comes the desired article, which any watchmaker may adjust to its place.

It will hardly be credited that some of the watches of foreign manufacture contain 600 or 700 more parts.

Waltham watches are made without the fusee and chain, the uses of which are fully answered by proper isochronism, and the evils of which are irremediable. It is needless to say that the more intricate the works of a time-piece, the greater the probabilities of injury, and the less the chance of uniform accuracy of performance. The first duty of a watch is to keep good time. Its other uses are decorative and subsidiary. The simpler its mechanism the more trustworthy its action; and the system upon which watches are constructed by the American Company is the very perfection of simplicity. The motive power is applied directly to the purpose, and is not dissipated amid a useless complication of machinery. The importance of this extreme simplification of structure must be apparent. The motive force has no longer to vitalize cumbrous and unnecessary *impedimenta*, friction is lessened one-half, and the liability to fracture two-thirds. Almost every one has inspected with bewilderment the interior of those plethoric bulbs of British origin, known as bull's eyes, and noted for never being right. They disclose, when opened to the light of day, a nightmare of recondite machinery, propelled with alternate vigor and languor by some imprisoned force, the origin of which defies investigation. There are labyrinths of wheels and innumerable radii of cogs, and slender chains, and coiled springs, and extensive axels, and a general blaze of highly ostentatious brass. During the inspection of this mysterious interior, the vehicle, very probably, stops, and declines to move on except upon the provocation of being tapped with severity against some hard substance. Of such was the well known time-piece of Captain Cuttle, which if turned forward fifteen minutes in the forenoon and backward half an hour toward evening, was, in the opinion of its owner, a watch that would do any one credit. The special vices of this primitive time-piece have not yet been altogether repealed in any of the instruments of continental manufacture. Their complexity continues unabated, and it is the evidence of precisely this fault to which the attention of the American manufacturers is, in a great degree, directed. How entirely the American manufacturers are justified in the changes they have made is attested by the recognition they have received from those whose judgment may be taken as complete and final. The advantages of simplicity in construction having been secured to the fullest extent that is expedient, those of perfect uniformity are, of course, more easily attained. And it is probably to these latter, more than any other causes, that the real value of the Waltham watches must be attributed. The important fact that there is virtually no variation in even the minutest details of all these instruments, is the one upon which most reliance is placed. They must all inevitably be equally good. Exact unity is the first quality which watches, by whomsoever produced, can possess. Exact unity is simply unattainable by the European processes. Of two instruments, simultaneously completed in a foreign workshop, it is impossible to expect that they will bear more than a general and superficial relationship to one another. There is no tie between them to hold them to exactitude. Deviations in regularity are always counted upon, to a greater or less degree, in imported watches, their harmony being contingent upon the most doubtful conditions. The dexterity or the good faith of individual workmen is all that can be trusted to for correct results. Here, however, nothing is left to the discretion of the artisan. From beginning to end, all is carefully wrought out by unvarying mechanical rule. The isolated particles must of necessity be identical in every watch, since they are modeled by force of machinery, and not by labor of hand. The most practiced eye or delicate touch might sometimes err, but the operations of machinery are without a flaw. The proof is in the circumstance to which we have before alluded, that fragments from one American watch fit perfectly and at once adjust themselves in any other. The grand result of this verisimilitude is, that in regard to time-keeping the Waltham watches are all alike. Microscopic variations, dependent upon accidental conditions, which under no circumstances can ever be guarded against, do, of course, exist; but they are so slight, as compared with the wider deflections of all works of foreign manufacture, as not to invalidate the rule of positive unity. The impossibility of important deviations, indeed, becomes evident so soon as the processes of manufacture are explained. This fact being established, as it has been with the American company, from the very birth of their enterprise, there needs no serious argument to prove the *general* superiority of their watches. The only question that could arise would be in respect of particular possibilities. In certain instances, there might be single instruments of foreign production finished with an accuracy beyond even the regular workings of machinery. But to meet this, the American company have devoted one department of their factory to the construction of a much more elaborate article than their usual average. There the advantages of strict identity in component parts are combined with those of the most dexterous workmanship. The parts are still produced by machinery, but they are adjusted by workmen of peculiar skill, who through experience or natural cleverness have the faculty of detecting the minuter qualities essential to perfect harmony and evenness in movement. Delicate shades of excellence in the jewels, or other materials used, are thus discovered and taken advantage of; and the watch passes through sympathetic hands, which assort and regulate its details with more particular consideration of their bearing toward each other than is deemed necessary in the ordinary instrument. In this way, watches of absolute equality with the finest results of European manufacture, are, in such quantities as demanded, regularly produced.

An important question naturally is that of the relative costliness of European and American watches. It appears that the advantage of cheapness is also with us. The difference in prices is not excessive, but is sufficient to be an object to any purchaser. The virtue of superior durability, however, is one which ought to be well considered in this regard. American instruments will outlast all others. It has been estimated that we pay Europe $5,000,000 a year for watches, and a like sum for keeping them in order. At our own door watches are manufactured at a lower price, of better quality, less likely to become disordered, and so arranged that in case of injury by violence the injury may cheaply and expeditiously be repaired. We not only have to pay, in importing watches, for the needless manual labor which is bestowed upon them, but endless tribute to those through whose hands they pass.

The manufactory itself is situated at Waltham, a few miles distant from Boston. It stands upon the border of the river Charles, and in the midst of a fresh and open meadow land. Within its walls the spindles and wheels are whirring, not with unseemly clangor, but with "a summer sound as of doves in quiet neighborhoods." Deft hands are moving, too, with swift and dainty celerity. There is nothing rude or cyclopean in the forging of these frail mysteries of machinery. The triumphs here are those of subtlety and cunning, not of force. To the unpracticed observation, the scattered elements seem to silently aggregate themselves into organisms. The watches are built like that Temple in the rearing of which no sound of hammer or of ax was heard. Little trays containing the myriad fragments pass from hand to hand, each successive transfer subtracting something from the dainty chaos, and adding something to the dainty order in which the particles gradually arrange themselves. Finally, after traversing numberless hands the perfect instrument emerges and is laid aside for registration. There is something equisitely light and graceful in all the processes through which it moves from its inception to the completion. As its elements are tiny and fragile, so the hands which combine them are light, and swift, and noiseless. Microscopic atoms coalesce; gossamer filaments thread the embryo organism; by and by life is breathed into the completed structure, and it palpitates forever with passionless iteration. The artificers are not exactly like other artificers. The work upon which they are occupied involves acute intelligence and dexterous touch. The lightness and the cheer of the factory itself must doubtless have its wholesome influence upon the operatives. Certainly the impression which they leave upon the mind of the visitor is very different from that which follows a visit to workshops in which grosser wares are manufactured. The cotton and iron workshops of Lancashire and Birmingham are populous with hungry and discontented creatures, bending over distasteful tasks in dim and imperfectly ventilated galleries. Sheffield generates formidable statistics of maladies occasioned by some of the processes of the manufacture of cutlery. Here among the comfortable artificers of Waltham there appears to be less of the prose of toil. Their industry is set to music. It does not blacken and bruise the hands, nor wrinkle the brow, nor strain the muscles, nor distort the frame. The great majority of the hands employed are Americans—New England men and women—whom a few years of experience have rendered as dexterous and as expert in their craft as the best among the continental artisans.

The operations of the Company have steadily widened since its establishment. At present it employs more hands and produces more watches than at any former period. Each year contributes testimony to the excellence of the instruments, and increases the demand for them. New varieties of form and quality have been from time to time introduced to accommodate peculiar exigencies of taste or necessity. There is the costly time-piece for the millionaire, and the inexpensive one for the clerk, or student, or artisan. There is the compact and tiny watch, jeweled and enameled, which ladies delight to wear at their girdles, and which they never remember to wind up. The varieties are so ample as to satisfy all the demands of utility or caprice. And it is but moderate eulogy to say that in exterior form and embellishment, no less than in interior excellence, they are fully equal to the best instruments of European importation; and this notwithstanding the fact of their comparative cheapness.

The success of the Waltham Company helps to solve an interesting problem. It is a kind of Declaration of Independence of old world ingenuity and skill. If we can make our own watches, we should certainly be able to excel in the other branches of manufacture in which Europe has hitherto led us. The factory at Waltham is the promise of other factories innumerable, which shall stud New England as thickly as her spires and school-houses, and in which the glass ware of Bohemia, the carpets of Berlin, the china of Sevres, the silks of Lyons, the jewelry of Paris, and countless other articles of luxury and use, shall be produced upon our own soil and by our own skill.

Mr. J. Dixon.—While listening to the article just read on American watches made by machinery, I was reminded of what has been done in this country by machinery over manual labor. I was carried along in my mind to the Springfield armory, where everything is made by machinery, where each particular piece is a duplicate of the other. I also recollected how the English had the machinery made here, the tools and all, and sent to England, and not only that, but they had also our American workmen sent out to them to show them how to use these tools, and now they make their small arms as well themselves.

Let us take the Achromatic object glass which we now make from fifteen to eighteen inches in diameter; in my recollection five inches was considered a very large glass. While in Boston, some time ago, I called on my friend Alvin Clark, and he showed me some letters he received from an English astronomer, in which he said he was much surprised to see an eight-inch object glass, and what he saw through it surprised him still more. He again states that he tried another glass, eight and one-eighth inches in diameter, which so far eclipsed the first that he did not know what to say. Clark has lately successfully finished a glass of more than twenty inches diameter. It is a common phrase that we are a fast people, and I think we are. I can remember well the progress of steam on the North river. I have seen the sills of the first shop where Fulton built his first engine in Jersey city, and it was here on the North river that he effected the practical establishment of navigation by steam. The Clermont was the first vessel which was ever wholly and effectually propelled by steam. And I should not be surprised but that many here will live to see the American watch, which will be greatly improved hereafter, take the place of the European article. It will not be long, however, before the art will be stolen from us; but as our benevolence is large, and we have furnished Europe with inventions and improvements before, we can spare this with the rest.

On motion of Dr. Parmelee, the subject of "Horology" was continued for the next meeting.

Adjourned.

American Institute Polytechnic Association,
May 28*th*, 1863.

Chairman, Mr. S. D. Tillman, Esq.; Secretary, Mr. John W. Chambers.

Mr. E. Stevens read a paper on sugar, and its effects on the human system, in which he endeavored to show that sugar is often injurious, and that it is the common practice in this country to eat too much of this article.

Mr. Benjamin Garvey presented some specimens of minerals found on the coast of Long Island, which were referred to Dr. Stevens for examination.

Horology.

The Chairman said among the modern improvements for measuring time the American clock stands prominent. We now make cheap clocks for nearly the whole world. In the year 1797, Mr. Eli Terry, then of Litchfield, Connecticut, took out his first patent for making wooden clocks; unfortunately the destruction of the Patent Office by fire some forty years later deprived us of all the interesting details concerning the early efforts of this inventive genius. From 1793 to 1807 Mr. Terry was constantly engaged in making clocks by hand. These clocks were put up without cases on the wall of the house, and were afterwards known as the old fashioned hang-up clocks; they were carried on horseback to the farmer and sold at his door. The clock maker started on his peddling tour with a full load, that is two in the saddlebags and one behind him. The best market in those days was across the North river, in the State of New York. Terry's business increased so as to justify him in buying an old mill in the year 1807, and adapting it to the manufacture of clocks, the most important part of which was the circular saw. Terry took out a patent for his mantle clock in 1816, and for additional improvements one patent in 1822, two patents in 1825, and three in 1826.

It should here be noted that many of the fine tools and mechanism for working in wood, which have given American mechanics a world-wide reputation, have been devised in the manufactories of the wooden clock and the wooden pump, both of which, owing to the abundance of wood and scarcity of metal, were in general use for many years, but have within the last thirty years gradually disappeared.

It would be interesting to know who first constructed the machines and implements now used in making the brass clock. Doubtless there are many worthy men in Connecticut who have devoted their lives to the perfection of this kind of machinery; they certainly have a better claim to the praise of posterity than those who have amassed wealth from the product of their genius and industry. Among the patentees of clocks are found the well known names of Harrison G. Dyer, Thomas A. Davis, James Bogardus and Rufus Porter. The improvements in machinery for making a clock are of more importance than in the parts of which it is composed. With a machine three men can make all the wheels for 500 clocks in one day. To what further extent this rapidity of manufacture is to be carried, probably American ingenuity alone will determine. A gentleman will now address you who is thoroughly conversant with the subject under discussion.

Mr. Dudley W. Bradley exhibited specimens of the movements of the different styles of American clocks, which he explained, and gave the following history of the clock business of the United States:

WOODEN CLOCKS.

The Yankee clock business was born, reared, and attained its present growth in the little State of Connecticut, and, I might add, all within a circuit of twenty-five or perhaps thirty miles. Eli Terry I might call the father, and money, or rather the want of money, the mother. Eli Terry was born in East Windsor, in 1772, and, during his minority, made several wood clocks for his immediate neighbors with the aid of a saw and a jack-knife; the latter tool being the principal one. In 1793 he moved into the town of Plymouth, and commenced clock-making as a business, but working alone and in a very small way. About 1800, he seems to have enlarged his business so much as to employ a boy or two to assist him. They would begin a dozen or two at a time, cutting all the teeth with a fine saw and finishing with a knife. These clocks Mr. Terry peddled himself on horseback. He sold them for twenty-five dollars each; this was for the movements alone. The first 500 clocks ever made by machinery in one lot, were commenced by him in 1808; all previous to this had been marked out with the square and compass.

The first mantle clock was made by Mr. Terry in 1814, which completely revolutionized the business. They were called the pillar-scroll top case. Mr. Terry sold Seth Thomas the right to manufacture them, for 1,000 dollars. They each manufactured about 5,000 a year at first, but finally increased the number to 12,000, and sold them for fifteen dollars a piece, wholesale.

METAL CLOCKS.

In 1818, Joseph Ives invented a metal clock—iron plates and brass wheels. This Jo. Ives, as he was called, was a rare genius, and ever had a new idea; but there was one idea that always stuck to him, and that was a "rolling" idea. I think I have seen twenty different constructions of movements that were the offspring of his brain—some very good, and none very bad. A Mr. Atkins appears to have been associated with him in later years. Mr. Atkins was a saw-maker, and for a time they made plates and wheels of scrap steel, bushing the plates with brass. He made all his movements with rolling pinions, but he used to change the escapement by sometimes making the verge or pallets rolling, and sometimes rolling teeth in the escapement wheel. He could not get out two lots of movements alike; one lot he would make of steel wheels, the next lot of brass, and perhaps the next lot mixed. Elliptic springs were quite a hobby with him; and his 30-day movement ran splendidly; in fact, ran so well, that the next lot he got out he put in a coiled spring and fusee. He had the power of his elliptic springs so nicely equalized, that the power did not vary an ounce in thirty days; and, by having two cords and barrels, it ran while winding. This coiled spring and fusee ran so poor, that he put the train into other plates and made a 30-day weight-regulator of it, which ran as well or better than Howard & Davis' best.

Mr. Jerome says, in his life, that, in 1807, he proposed to his guardian to get him a situation with Mr. Terry, to learn the business, but the reply was, that Mr. Terry was a fool, that he had commenced 200 clocks and he never would live to finish them, and if he did he never could sell them. Jerome, in after years, manufactured 200,000 a year himself.

Up to 1822, they sawed veneer for their cases with a handsaw. In the year 1835, our Southern brethren became so incensed at the Yankee clock peddlers that they raised the price of licenses so high as to amount to a blockade. That state of affairs could not last long, for they wanted clocks and the Yankees wanted money—and especially the money; so Chauncey and Noble Jerome started a factory in Richmond. Everything was made in Connecticut—even to printing the labels in Hartford—for the great clock manufactory in Richmond. Having a clock manufactory in the South, seems to have pleased the F. F. V's very much, until they found that all the tools they had were a few pairs of plyers and a jack-knife to each of the Yankees that went down to finish them up. Another company went to

Augusta, Georgia, on the same errand and at the same time. Neither staid but a short time.

The first one-day brass clock appears to have been made by Jerome, in '38. This, together with the competition that sprung up, brought down the price to a very low figure. The first clocks were sent to England in 1842. A Mr. Peck, from Bristol, went out as agent. Mr. Peck wrote back several times that he would have to send them home again, but Jerome insisted on his sticking to it. The English were incensed at the idea of the people who made clocks for all the world, buying of the Yankees. Finally, a merchant gave Mr. Peck permission to set two of them running in his store, and attaching the price. The next day, Peck went in to see how they were getting along, and found them both sold. There was something so strange about it, that the merchant let him leave four more, and the next day found them sold. In a few days, the merchant gave an order for 200 more. The neighboring merchants, finding them selling, all went in for the Yankee clocks. Two other consignments were made, which were seized at the custom-house; but, finally, John Bull found this did not pay, and allowed the Yankees to have their own way in the matter. I think the first lever clock was made by Kirk, in New Haven, about '45. He used a double escapement wheel, and had it patented; but the same escapement is described in Reid's work, published in 1823. They ran very well when in good order, but the balance being heavy, and standing upright, the bottom pivot soon increases its bearings so much that it runs hard. Kirk also added a striking part to run from the same spring. All of the first lever clocks were made too heavy, and did not perform well. Those made now have a crown wheel, not much heavier than a watch.

A writer in the Atlantic Monthly for January, claims the first clock made entirely in this country to have been the work of Benjamin Banneker, a negro astronomer, near Ellicott's Mills, Maryland, and who had never seen a clock in his life, in the year 1762; he took a watch for his model.

Clocks were early made in Jersey, and a Yankee went down there to make some cases in 1812–13. These were the old English styles.

THE BEST BRASS CLOCK.

And now, Mr. Chairman, I will show you what I consider one of the best and simplest eight-day movements made in America, or in Connecticut, for as far as clock movements are concerned that constitutes America. There are movements made in Williamsburgh, but they are hardly of enough value to be counted in the catalogue (that is my private opinion). The movement which I hold in my hands runs eight days and strikes, but perhaps you will be surprised to learn that it contains almost as many pieces as a fine French one. A French movement contains about 200 pieces, and this contains over 150, yet the machinery by which it is made is brought to such perfection, that the whole is finished in the time it takes to make the spring, barrel or pallets in the French. The outside form is struck out by one blow, the inside at another, and the holes to receive the pivots, stud for the pendulum and rivets for fastening the bridge, are all done at one blow. The wheels are struck into their present shape, excepting the teeth, they are straightened up, and from ten to twenty-five put on a mandril, screwed up solid and put in the cutting engine, and the requisi number of teeth cut on them. The Yankees use almost exclusively lantern pinions, claiming that they run with less friction and not so likely to choke with dirt, but it is possible cheapness has something to do with it. The needles are iron wire, yet if the pitches are correct, they wear out the other parts without hardly marking; if not correct, they cut through in a year or more so as to be unserviceable, and have to be renewed. The arbor holes are bushed, but, excepting the back side, they are useless, for they will never wear. The train consists of four wheels; the main wheel has ninety-six teeth, the first pinion eight leaves; the second wheel eighty-four teeth, second pinion six leaves; crown wheel forty teeth, and runs with a seven-inch rod. We use the same movements with several lengths of rod, by adding teeth to the crown wheel; two teeth added make nearly three-fourths of an inch less rod, or fifty teeth a four and a half inch rod. In some of the movements a leaf is added in the third pinion, making two inches less rod, and it sometimes occurs that the movements, long rod, short rod and medium, get beautifully mixed up. A centre pinion of ten and a wheel of forty teeth, multiplying together twelve times, make up the dial wheels. These main wheels turn once in twenty-four hours, and nearly the same train is used for the striking side. The count wheel is fastened to the main wheel and revolves with it, consequently is divided into 156 points, with slots at intervals to divide the hours. The second wheel has seventy-eight teeth and thirteen pins, that carry the hammer, and consequently revolves twelve times in twenty-four hours, counting 156 strokes. The three eighty-teeth wheels turn once to every stroke, and have attached a cam with slot and lock wire, so that whenever the count wire drops into a slot in the count wheel, this locks instantly. When striking, a pin on the centre shaft lifts another wire, which unlocks this one, and at the same time catches the fly and prevents the train running until the proper time arrives, when it drops, leaving it free to run until the count wire drops, when it again locks. The springs are about eight feet long, they call them nine feet, but steel being high they shrink.

Some years since a patent was taken out by some immortal genius for using brass springs, and fabulous prices were paid for the privilege of using them, but they were more costly than steel, and a short experience proved them to be almost worthless. The form of count wheel was also patented, but I have seen a German clock, made in the fifteenth century, according to the date on the dial, that had the same count wheel. This clock was made almost exclusively of wood; the escapement wheel was wood, with pins on its face and a bent wire answered for pallets. The bell was of glass and similar in shape to the covers watch repairers use to cover their work on the bench. The hammer was of wood, and the tone of the bell was superior to any other I have heard.

The making of wire bells puzzled the Yankees somewhat, but they finally overcame the difficulties, and succeeded in making them as fine as the French or German. Wire bells are not hardened, but the tone is given by annealing *after they are coiled.* No tone can be given them in any other way that I know of. Steel wire, the finer polish the better, is cut into proper lengths, proportional to the proper size of wire, a brass ring soldered on, the wire coiled into shape, then drawn to a deep blue, which gives the tone. Mr. F. C. Andrews, now with the American Clock Company, No. 3 Courtland street, was the first to attempt making them in this country.

Although machinery has been brought to great perfection in making clocks, still much has to be done by the hands, but even these become as it were a part of the machinery, for boys and men work for years drilling pinions, drilling collets, turning pivots, &c., and seldom change work. A lad drills a thousand or more of these collets in an hour; another almost or quite as many needle holes, while another turns from five to seven hundred of staffs with collets and pivots in a day, getting forty cents a hundred. Little girls drop in the needles and stamp them. Girls also paint the dials. A lad puts together 150 to 200 in a day, and another, more experienced, sets the escapement and lock work. Another gang of men finish or put all the parts together; one takes a case and puts in the movements, passes it to the next, who puts in the bell, the next one puts in the rod and beat, the next puts on the dial and hands, the next hangs the sash, and so on. The whole together getting two to three cents each clock. I have helped three others finish in this manner 300 clocks in four hours.

Clocks for the million has been the Yankees' motto. I cannot say that they have aimed at perfection, or if they did, but that they shot wide of the mark. Our friends across the water boast of clocks that run for years and not varying a minute, and chronometers that make voyages to the Arctic regions and come back not two seconds from their rate; but for some unaccountable reason their watches, clocks or chronometers that get into this benighted region, do not carry out those assertions.

The Yankees have never troubled their brain any further about compensating rods, than to make occasionally a wood one, and in my humble opinion a rod made entirely of wood, without steel at top or bottom, would be as correct as we would need. It is the cases that sell Yankee clocks, consequently they make the movements to suit the cases, and not cases to suit the movements. They make eight-day movements with three-inch rod, and yet, with a heavy bob, they keep very good time. There is more or less of the bugbear about gridiron pendulums, for about one-half of the massive, ponderous things, especially in French clocks, have the centre rod running directly through with the nut at the bottom, and have not a particle of compensating power about them.

One word as to balances. It is a well known principle that in every balance spring of sufficient length, a certain portion of it will be isochronal, whether long or short. Now this is the point when found (and it can only be found by experiment) that gives correct vibrations. If this portion be lessened the long vibrations will be quicker than the short ones, and if increased beyond this point, the short vibrations will be quicker than the long ones. Now if this point is arrived at, why will not a watch with a going barrel run as well as one with a fusee? There seem to be two difficulties in the way, one is that it has to be brought to true time, and doing this by the common regulator destroys this equipoise. Chronometer makers regulate by screws in the balance, by which this difficulty is overcome. The other difficulty seems to be that the heat and cold throw it out of time again; this in turn is remedied by compensation and movable weights. If it gains by heat the weights compensate too much and must be moved in; if it gains by cold the weights must be set farther out. To determine this the chronometer is run in an oven at 100 to 120 degrees, and then again in a refrigerator as low as possible, until the exact point is reached. Chronometers are not often brought to true time, but after it is brought near, a record is kept of each day's variations, and when it goes to sea this record or rate of variation goes with it to assist the mate in keeping his reckoning. Capt. Crouch, of the Creole, told me a few voyages since that he came near losing his ship by being given a wrong rate with his chronometer. I have at home a Willard clock that was made with a recoil escapement; but a short time since I repaired it and put a dead-beat escapement in. It keeps very good time, sometimes running months without any perceptible variation.

Dr. Rowell.—Mr. William Pardee made clocks several years ago of type metal, or a composition of lead and zinc. The pinions were like the lantern pinions. I had one running in my house for a year. He also made cast-iron clocks with three wheels; the clock I had kept very good time, but the brass clock coming into use threw it out of the market. It was said that Mr. Pardee was the inventor of the gimlet-pointed screw, but at that time he could not get any one to assist him in introducing it. I recollect in my boyhood of a cast-iron clock on the village church; it took up the space of two feet square, and had but one hand and that was the hour hand; it took two barrels of old cast iron to make it go, and a full half hour to wind it, yet it served to tell the hour very well.

Mr. Dibben.—I have a clock of the same make as the one Mr. Bradley first exhibited, that keeps the very best of time. I have also a watch which is considered a very fine one, and I find that the clock keeps far the best time. I have access to watches that are deemed the very best, and that are frequently timed and corrected by the sun, and comparing my clock with them, I find it does not vary perceptibly for a long time. I will guarantee that it will not vary two seconds in a day, and this clock I bought for one dollar and fifty cents. There is nothing remarkable about this, there are no doubt hundreds of clocks that will do the same, only it requires to be properly set and then regulated and regularly wound, for a great deal depends on regular winding.

INDIA-RUBBER SPRINGS.

A specimen of India-rubber car spring was presented for inspection that had been in use four and a half years.

Mr. Dibben.—Rubber spring has a greater durability than most people imagine. I have known railroad companies to throw away rubber springs when a little worn, and these to be bought up and brought to the factory, put in a lathe and turned down, and then sold back again as new to the railroad company. There is a great waste in this practice of throwing out half-worn springs.

Mathematical Instruments was selected as the subject for the next meeting. Adjourned.

American Institute Polytechnic Association,
June 4th, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, John W. Chambers.

The subject for the evening, Mathematical Instruments, was opened by the presentation of Blunt's Dividing Engine, for dividing mathematical instruments, when the Chairman said,

This graduating engine is a very important instrument, for by it all mathematical scales can be graduated with great exactness, a feature of immense value in all scientific measurements. We are indebted to the improvements in mathematical instruments for those important discoveries which have contributed so much to intellectual advancement in our age. The great difference between the ancients and the moderns, is that the ancients discussed abstract questions only, without ever trying experiments. This was the case in their study of Geometry, they failed to practically apply its laws, because they had no instruments with which to make the necessary observations, and hence their progress was very slow They reasoned by deduction alone. They were never precise in their statements of physical facts, hence the inductive sciences were to them unknown. It is related of Pythagoras that he sacrificed 100 oxen to the Muses, when he discovered that the square of the hypothenuse of a right-angled triangle, is equal to the sum of the squares of the other two sides. The application of this problem in modern measurement, has led to very important results. The mechanical ingenuity of very recent times has greatly facilitated the accumulation of the vast store of facts connected with the heavenly bodies. By the perfection of modern instruments we can more accurately explore those portions of the universe within the range of human observation.

Among the instruments which have contributed to the advancement of science. the telescope and microscope are the most prominent, for they reveal to us innumerable wonders above and beneath.

Thermometers.

Mr. Victor Beaumont exhibited several specimens of his metallic thermometers, and explained their mode of construction. They were made, he said, of two strips of brass, with one of steel; these three pieces were bound together and placed in a fire, and soldered or brazed with silver. These strips, after being brazed, vary more or less in their expansibility. One will give a motion of one inch, and another three-fourths of an inch. In graduating them they are placed in a room of fifty or sixty degrees temperature, and are made to agree with the mercurial thermometer. They have been some three years in use, and appear to give general satisfaction. My object was to make a metallic thermometer that would be cheap in comparison with the imported ones, and at the same time, accurate. Those made at Paris and imported here, are sold at five dollars and upward, while mine are made with improvements on the French, and sold at one dollar and twenty-five cents, and one dollar and a half.

Mr. Read.—What is the object in having the steel between the strips of brass?

Mr. Beaumont.—The steel acts as a spring to bring back the brass when it has expanded. The brass being softened by the brazing, has hardly any elasticity, and without the steel, would not go back on a change of temperature. Particular attention is given to the brazing, as the least fault in it will render the strips unfit for use.

Mr. Read.—As the strips of brass are soldered together, why would not a solid bar and one piece of steel answer the same purpose?

Mr. B. Garvey.—The use of thin plates or ribbons are very essential, in order to make them very sensitive. Solid bars of the same thickness would take a longer time to make any perceptible change. The object is to have the least amount of metal to be acted upon by the heat. We all know the time it takes a large mass to be heated or cooled. There is in this thermometer, two small ribbons, which are affected by the slightest change of temperature.

The Chairman.—The first thermometer was invented by a physician of Padua, named Sanctoria, and is described in a work published by him in 1626. It was a rude contrivance for measuring the temperature by means of the contraction and expansion of given quantities of air. The alcohol thermometer, in nearly the same form as now seen in the rooms of the American Institute, was used about the year 1650. This instrument measures the changes in the temperature very clearly, owing to the large scale used, and is of service in the coldest climate, because alcohol has not yet been frozen, but it boils at 176, or 36 degrees below the boiling point of water, and is therefore almost useless in the laboratory. Reaumur is said to have invented the mercurial thermometer, in 1709; but we find that Fahrenheit, in the same year, had subjected mercury in a graduated tube, to the most intense cold of Iceland, in order to place his zero point as low as possible, and thus prevent the use of the minus sign in measuring heat. He then placed it in freezing water, and marked that point at 32°; the tube was then placed in boiling water, and the height of the mercury was marked at 212°. Artificial cold has been produced far below the freezing point of mercury; so there seems to be no reason for retaining Fahrenheit's scale, except that its very general use has made it the public standard. Reaumur made a spirit thermometer having the freezing point at 0, and the boiling point at 80°. The Centigrade thermometer has, however, become the favorite among scientists, because the melting point of ice is the zero point, and 100 degrees the boiling point of water; thus bringing all estimates of heat into decimal relations with these well known fixed points.

The time has already arrived when more accurate and delicate measurements are required in scientific investigations than can be made with the mercurial gauge. Numerous trials of solid metallic thermometers have been made, but experience shows that while they are in some respects more convenient to use, they do not mark changes of heat with uniform accuracy, owing in most cases to the use of the mechanism requisite to give the index hand a motion perceptible to the eye. The most sensitive metallic thermometer which has come under my own observation, is one constructed by Mr. Russell, a skillful mechanician of Seneca Falls. It consists of many zinc tubes standing in a double row on either side of a bar, which is the common fulcrum. The rods are connected at either end with each other by levers, which are designed not to increase the motion, but to communicate the sum of the motion of all the rods to a common wheel, where the motion is increased by more delicate mechanism. The sensitiveness of this instrument is so great that the index finger starts up like a thing of life upon the near approach of any person. Its size prevents its use for any purpose except to note the changes in the temperature of the surrounding air.

The most delicate test of the presence of heat for a limited period is the thermo-electric pile. The slight current of electricity generated when one end only of the pile is heated is conveyed to the ordinary galvanometer, and, as increasing or diminishing the heat increases or diminishes the strength of the current, the index of the galvanometer becomes an index of heat. Melloni has made many interesting experiments with this instrument, which is said to be so delicate as to indicate the comparative bodily heat of insects.

Mr. Garvey.—The metallic thermometer, there are grounds to suppose, can never be relied upon as an accurate indicator, as we have to depend on experiments in each case for its correctness. It occurs to me that we might get a metallic thermometer in which some of these difficulties might be eliminated; for instance, let us take a small piece of wood, free from moisture, and to it we attach a hand, which is placed on a dial, and another arm or stem of chemically pure metal, such as copper deposited by electricity. Holding this hand, with such an arrangement, I conceive it possible to get a sufficient amount of sensitiveness to indicate very slight changes of temperature. The metal being homogeneous throughout would be free from the errors arising from the use of steel.

Mr. Beaumont.—The most sensitive metallic thermometer in use is that invented by Breguet, which consists of five plates of platinum and five plates of steel, soldered together with silver and rolled out almost as fine as paper; this strip is coiled into a spiral and suspended from an upright; at the lower end an index is fastened which moves over a dial.

Mr. Dibbin.—How is it with your thermometer as to keeping in tune, as it were? That is, after being once set, will it always come back to the same point for the same amount of heat for which it was graduated?

Mr. Beaumont.—The first thermometers I made were five degrees out of place in two weeks, and I was puzzled to know the cause. I set them aside for six months and then set them again, and now they are right. I attribute this variation to inequalities in the steel, and it becoming expanded too much, or at least beyond the point at which it was graduated, the elasticity of the steel not being enough to bring it back.

HEAT REGULATORS.

The Chairman.—This subject of thermometers recalls to mind the methods devised for regulating the heat of stoves. These all originated at Seneca Falls, in this State. About the year 1842 or 3, there were four or five lawyers in Seneca Falls who devoted a large portion of their time to practical mechanics. Among them was John Maynard, afterwards a judge of the supreme court. At one period he spent all his leisure time in the machine shop. I have seen him leave the court room, return to his residence, and immediately go to the work shop and resume his labors on a new rotary engine. In 1842, about the time of the introduction of sheet iron stoves, there was considerable attention directed to their advantages, but it was soon found that without great care in the regulation of the drafts, they would burn out, therefore attempts were made to devise some remedy to obviate this evil. It was also found that the joints where the sheet iron was fastened to the cast iron rings at the top and bottom would soon corrode by the pyroligneous acid from the wood collecting at the joints. These stoves would heat very quick. If the damper was left open after starting the fire the combustion increased so rapidly that the stove became red hot in a short time. Elisha Foot, Esq., a lawyer at Seneca Falls, invented a self-acting damper for these stoves. It consisted of a brass rod, made of sheet metal, and connected with a lever, which came through the centre of the stove, and moved a rock shaft, on which was a simple index plate, coming out far enough to hang on a pendulum rod, moving to and fro between two cogs on the damper. The principle applied was the difference between the expansion of a brass rod and an iron rod. When heat had expanded the brass rod the motion was communicated to the pendulum rod, which closed the damper and passed on, until the stove began to cool and the brass to contract, when it would return and open the damper, which remained open until the fire became too intense, when it was partly closed; and in this way would alternately open and close the damper till the fire would get just sufficient air to keep the heat at the point desired. About that time it occurred to me that it would be better to regulate the draft from the outside of the stove, and I accordingly took out a patent for what I called a thermostate, thus dispensing with Foot's rod. It regulated a damper placed on the top of a stove, which was connected with an air pipe placed on the inside and running nearly to the bottom of the stove. By this arrangement there was no danger of coals or fire being blown out upon the floor by the explosive mixture of gases and air, as is sometimes the case where the damper is on the side and near the bottom of the stove. The thermostate consisted of a zinc ring surrounding the damper, and resting upon the stove; on the upper side of the ring was a groove, into which was placed a broken ring of steel, one end of which was fastened to the zinc and the other left to play freely. As the zinc ring expanded the ends of the steel ring moved from each other, and as the zinc contracted they approached each other. The moveable end was connected with a lever which moved the damper. The machine was too delicate and expensive, and never came into public use. This principle, applied as a thermometer, might be of some service, as the action of the steel, both for increase and decrease of temperature, is a positive motion, depending constantly on the expansion or contraction of zinc, which is the most sensitive of the metals to heat. I afterwards found Dr. Ure, of London, had made a heat regulator to which he had given nearly the same name, but in his the elasticity of the metal was made an element, and it could not be reliable. For this reason the spiral thermometer of Breguet, described by Mr. Beaumont, is really of no practical value. Experience has proved this. Mr. Washburn Race, also of Seneca Falls, carried out this idea of regulating the radiation of heat from a stove very effectually by applying the principle, and almost the identical mechanism used by Bonnemain, of France, for regulating the heat of the water in his eccálobion or egg-hatching apparatus. A brass rod was fastened at one end by a set screw to a cast iron frame, which was placed vertically on the outside of the stove, and at the other end by a hook to a lever, which moved a damper within the same frame. The heat of the stove expanded the brass rod, and allowed the damper to fall by its own weight, the hook passing out of the lever if the rod continued to expand. The damper being closed, the supply of air to the fire was shut off and combustion was checked; as the stove cooled the brass rod contracted until the returning hook caught into the lever and opened the damper. By turning the nut of the screw, at the top of the frame, the rod was virtually made longer or shorter, and thus it was adjusted, so that the heat could be maintained, quite regularly at a fixed point. The apparatus was not near as sensitive as that of Judge Foot, but it was sufficiently so for ordinary stoves. It could not easily get out of order, and was a cheap device. I think the first cost of a regulator was less than fifty cents. It was not surprising, therefore, that this cheap and quite ornamental addition to the ordinary sheet iron stove, which had been improved by the addition of a cast iron top and bottom, should have a very extensive sale. I think I am within bounds when I say that more than 100,000 stove regulators have been manufactured at Seneca Falls. There was hardly a township in all the country, where wood was used as a fuel, in which these self-regulating stoves were not to be found.

As I have before stated, Judge Foot claimed the use of a metallic rod in connection with the damper to make it self-acting. He commenced an action for an infringement of his patent against the manufacturers of Race's regulator, which resulted in his recovering very heavy damages. About this time Benson Owen, Esq., another lawyer of Seneca Falls, invented a regulator which was even more simple and cheaper than that of Mr. Race. It consisted of a strip of brass about a foot in length, riveted at both ends to an iron frame, so as not to be taut in the coldest weather. A lever damper rested, by means of screw, on the middle of this brass strip. As the heat of the stove increased the strip expanded, and being fastened at the ends its greatest action was at the middle, which allowed the damper to descend by its own weight. As the stove cooled the strip was less slack, and its motion raised the lever damper. By turning the screw resting on the strip, the damper was raised or lowered, and thus set for any required heat.

For stoves in which anthracite coal is used, these self-regulating dampers are of little use, because it requires a strong draft for a long time, comparatively speaking, to start a coal fire, and when once kindled the combustion cannot be checked so readily by closing the damper. Heat, at any rate, is given off with but little diminution for some time after the damper is closed. But in wood burning districts, where people have discovered the folly of wasting fuel in an open fire place, when nine-tenths of the heat can be saved and utilized by means of an air-tight stove, these automatic dampers are very efficient. They have been found of great use in the room of the sick, where it is essential to maintain a uniform temperature.

It was decided to continue the discussion of philosophical measuring instruments at the next meeting.

Adjourned.

American Institute Polytechnic Association,
June 11*th*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, John W. Chambers.

Measuring Instruments.

The subject continued from the last meeting was taken up, when Mr. G. Tagliabue exhibited several instruments, among which were two thermometers used in the last Arctic expedition of Dr. Hayes. During that voyage they indicated a temperature of 75° below zero. Mr. Tagliabue said he was making a spirit thermometer for Captain Hall, for his intended expedition to the Arctic Sea, which would show 90° below zero. Mr. T. also presented a self-registering thermometer, for green houses, by which the highest and lowest temperature, during the night or day, could be ascertained, The index having to be reset by a magnet, in possession of the proprietor, only, placed the registering index beyond the control of the person in charge. A mercurial barometer, with an improvement for reading the scale, was next presented by Mr. Tagliabue.

The Barometer.

The Chairman.—The barometer is a modern invention. It was brought into use about the middle of the seventeenth century. The investigations, which resulted in the discovery of the pressure of the atmosphere, and the invention of an instrument for measuring this pressure, was commenced in Italy in an attempt to answer the queries of practical mechanics. The pump makers of the city of Florence found that it was impossible to raise water by suction higher than about thirty-two feet. In this dilemma they sought the great philosopher of the time, Galileo. He, however, was unable to furnish any satisfactory explanation. The old reason that "Nature abhorred a vacuum," always given for the rise of water, in the suction pump, was futile, and Galileo's reply to the pump makers was virtually an admission that Nature did not abhor a vacuum above a height of thirty-two feet. This answer was very unsatisfactory to the philosopher himself, and he made some experiments upon what he called the power of a vacuum. His other duties and his advanced age prevented the continuance of his investigations in this direction, but he earnestly entreated his pupil, Torricelli, to pursue the subject. The first, and very important step of the latter, was to ascertain whether the height to which a liquid rose was in proportion to its density. He knew that the liquid metal mercury was about fourteen times heavier than water, and decided to make an experiment with mercury, in a glass tube, so that he could watch the action of the metal. Accordingly, he prepared a tube of glass about four feet long and a quarter of an inch in diameter. After hermetically sealing one end, he filled it with mercury, and placing his finger upon the open end, he elevated the tube to a vertical position, then placed the lower end into a basin of mercury, and withdrew his finger from it, when the column fell about a foot and a-half, and remained stationary at a height of about twenty-nine inches. His next experiment was to pour water into the basin containing mercury, and raise the open end of the tube above the mercury; the result was the falling of the mercurial column and the filling of the entire tube with water. The inference drawn by Torricelli from this simple and beautiful experiment was, that the force which raised the water and mercury columns was due to the pressure of the air upon the liquids in the basin.

Three years after this, Pascal, of France, commenced his experiments with the Torricellian tube, which resulted in proving that the density of the atmosphere diminishes in proportion to its elevation above the earth. In 1653 he directed his brother-in-law, Perier, who resided in the mountainous district of Avergne, to prepare two barometers and ascend the highest peak in his neighborhood, with one of them, leaving the other at its base. Arriving at the summit, Perier observed the column stood at the height of 24. 7 inches; on descending to the base, the columns in each barometer stood at 28 inches. This instrument has been of great service in measuring the altitude of mountains, especially on this continent; but its most important use is in observing the constant changes in the density of the air. Since the discovery that the falling column indicates rain, and the rapid falling a coming storm, the barometer has been considered indispensable to the navigator, and has been often of great benefit to the intelligent farmer, especially during the growing season.

Objections have been raised to the mercurial barometer, owing to its size, and the care required in carrying it from place to place. These have been obviated by the metallic barometer. The most noted of this class is that invented by Vidi, of France, called the Aneroid barometer, from the Greek word *aneromai*, (I enquire). It consists of two corrugated disks of brass, united to a ring, so as to form a chamber, from which the air is exhausted. The centres of the disks approach each other in proportion as the atmospheric pressure increases, and recede as the pressure diminishes This motion of the disks is changed by ingenious mechanism, so that the axis of motion is perpendicular to the face of a graduated circular scale, over which moves an index hand. The whole is compact, not exceeding five inches in diameter and an inch and a-half in depth. Another was invented in 1850, by Bourden, depending on the action of a concave and a convex thin plate, cut in the shape of a segment of a circle. The manufacture of metallic barometers has been carried on quite extensively in this country, by Mr. Beaumont, specimens of which will be presented for your inspection this evening.

Mr. V. Beaumont here exhibited different sizes of his Aneroid Barometers and explained as follows:

The Aneroid barometer was invented in 1793 by M. Conte near Paris in France. In making balloon ascensions for the army he found the mercurial barometer very difficult to read on account of the violent oscillation of the balloon. He therefore invented a metallic air tight vacuum box similar to a watch case, between the flat sides he put a spring to press the lid out after the atmosphere became lighter; to the lid was attached a suitable index to show the motion of the varying changes in the weight of the atmosphere. But this instrument was found to be useless on account of the expansion of the metallic case, caused by the variation in the temperature at different heights from the surface of the earth. In 1845 or '46 M. Vidi made an improvement on this style; he made a flat circular box, corrugated top and bottom and soldered to a rim, the corrugation was to give the flat sides greater elasticity. It was said that Vidi used a compensating case inside the corrugated disks, but the difference between his and Conte's is simply this, that Vidi leaves sufficient air inside the plates to correspond to a pressure of half an inch of the mercurial barometer, so that the expansion and contraction of the enclosed air serves to correct the opposite contraction and expansion of the case, and in this consists the whole of M. Vidi's secret. If a perfect vacuum is made between the plates the index goes up by heat, and if there is too much air left in, it will also go up by an increase of temperature. So I found in my first experiments that a perfect vacuum would not answer, and I now make a vacuum in my barometers on a clear dry day. If the small quantity of air enclosed is damp it has a very bad effect, so I keep them in a dry room for twenty-four hours, and then they are put into a box with quick lime and left until the weather is very dry, or the barometer is very high, they are then gauged so that when the mercurial barometer marks twenty-nine, the aneroid marks twenty-eight and one half inches; there is always a difference of half an inch between the two barometers while they are being graduated. During my experiments I found that metals were weakened by cold and strengthened by heat, and that a strip of steel or other metal has a varying strength according to the temperature in which it is placed. At first I thought this was due to dilatation, but I found that this was not the cause. If we take a solid block of metal and heat it, we will find it to expand a given bulk; now if we make a hollow box of the same size as the solid one, and heat it to the same degree, we will find it expand to precisely the same bulk; so that whether hollow or solid it will increase the same in size for an equal temperature.

The machinery of the Aneroid Barometer that gives motion to the index is very simple, and very slight changes are indicated by it. The barometers are made of different sizes; the largest I make are ten inches in diameter, the cheapest are sold for $6.50.

The Chairman.—A very large barometer was made at the suggestion of Prof. Ellet a few years ago, under the direction of Prof. Henry, for the Smithsonian Institute. It was filled with sulphuric acid of a specific gravity of 1.8, that is, nearly twice as heavy as water. The tube must, therefore, be about fifteen feet long. The object was to get a very large range of measurement. Sulphuric acid has an intense attraction for water, this was, doubtless, guarded against in that instrument, which I have never had the pleasure of seeing.

Mr. Tagliabue.—That barometer was made by Mr. Green of this city, a well known mathematical instrument maker.

Dr. Warren Rowell.—Captains going to sea usually take both the aneroid and mercurial barometers with them. They consider the arenoid the most sensitive. In the Government vessels they take a note of the barometer every half hour, but if the change is sudden it is reduced to fifteen minutes, or even less if the fall is very sudden.

The Chairman.—The aneroid barometer is very useful and convenient for the farmer in foretelling the changes in the weather. It is very generally supposed that whenever the index shows a diminished pressure of the atmosphere there will be rain; this does not always follow. When the pressure is very low, strong winds succeed though there may be no rain. But it is lowest for wind and rain together, the simplest rule is that when the fall is sudden there will be a storm.

Mr. Bartlett.—There seems to me to be one paradox in the barometer, and that is, when the air is dry the mercury rises, showing an increase of pressure; but when the air is largely saturated with moisture, and would appear to be very heavy, the mercury falls.

Dr. Rowell.—If the barometer is at thirty inches of course there will be more moisture in the atmosphere, because there is an inch more of air, but the air can only be saturated with water equal to its own density, and cannot sustain anything heavier than itself; for when the atmosphere becomes saturated beyond its own density the moisture falls to the earth.

Mr. Garvey.—If that were the case would it be possible to get a mixture of alcohol and water, as alcohol is lighter than water, or could we get a mixture of carbonic acid with the air? We know that moisture will rise from water into the atmosphere, but by what process? we know it is not by gravitation; the mixture of alcohol and water can be made to diffuse itself equably.

HYGROMETER.

Dr. Rowell explained the wet-bulb hygrometer on the table. He said this instrument consists of two delicate thermometers placed side by side. The bulb of one is covered with cotton, leading into a vessel containing water. The capillary attraction through the cotton keeps the bulb always moist, the temperature of which becomes lower as the evaporation continues; and when the mercury arrives at a fixed point the difference between the heights of the two thermometers shows the comparative state of dryness of the air. I see there is a difference of seven degrees between these two thermometers in this room. If the air be moist less evaporation will take place, and the decrease of the temperature of the wet bulb will be slight; but if the air is very dry the evaporation will be very great, and the temperature diminished also.

SELF-REGISTERING MEASURING INSTRUMENTS.

The Chairman.—The modern science of meteorology requires for its further advancement frequent and regular observations of the changes in the pressure, temperature and humidity of the air, and in the direction and velocity of its currents, as well as of magnetic variations, as shown by the dip and inclination of the needle. This service is performed by thousands of observers in different locations over the whole surface of the globe. In this country several hundred are under the direction of the Smithsonian Institute. Their observations are made at three or four stated periods during every twenty-four hours. Of course it would be a great desideratum to have the record of changes continuous. This can only be accomplished by self-registering instruments. Many attempts have been made to connect recording attachments with the barometer and thermometer. Thus far they have failed, because the power required to move the index being derived from the metal of the instrument, necessarily retards its changes; but the advance in one branch of art often helps another. This has been the case with photography, which has happily presented the means for the most perfect registering of meteorological changes, without in the least affecting the instruments used. The invention is a simple combination of photographic paper, with apparatus before in use; yet it must be regarded as the most perfect philosophical instrument ever made. A description of its application to one of the most delicate of instruments—the dipping needle—will illustrate its importance. To the end of the needle is attached a small mirror, and to the other a counter weight, so that the needle will still be perfectly balanced. At a short distance, obliquely from the needle, and having no connection with it, is placed a cylinder, which turns on a vertical axis, and by clock-work machinery makes just one revolution in twenty-four hours. Around this cylinder is attached a sheet of paper, made sensitive to the action of light, and around the whole is a stationary case, having an opening through its whole length on the side towards the needle. At an equal distance, in an oblique direction on the other side, is placed a lamp, the rays of which strike the little mirror and are deflected upon the photographic paper, making a continuous mark, ranging in altitude as the end of the needle moves upward or downward. The graduated scale by which this altitude is measured should have gradually decreasing intervals from a central point, to compensate for the curved motion of the mirror. At the end of every twenty-four hours another sheet of paper is substituted. Thus the subtle magnetic force silently records its own changes, with a constancy and correctness which human hands can never equal. This photographic arrangement can be applied to every philosophical instrument which measures by motion. Indeed, all the measurements could be made side by side upon the same sheet, and three hundred and sixty-five of them following in daily consecutive course would form an Annual of Observations. The cost of this apparatus will for some time prevent its general use; but by-and-by, as the public appreciate the importance of watching, without intermission, the motions and forces of the material world, they will be sought after with avidity. And, finally, the time will come when many a hill-top in every civilized country will be crowned with an observatory, and filled with philosophical instruments, which will be the favorite resort of those votaries of science who have learned that the Creator communicates the immutable mandates concerning matter only to the patient seeker.

The subject of Mathematical Instruments was continued for the next evening.

American Institute Polytechnic Association,
June 18th, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, John W. Chambers.

Mr. J. K. Fisher read an extract from an English journal, giving an account of the trial of a new traction engine built in England. The engine weighed eight tons, and ran on a common road at the rate of eight miles an hour, carrying twenty-two tons altogether, including the weight of the engine.

Street Sweeping Machine.

Dr. J. B. Rich read a description of Middleton's new street cleaning machine, which was tried on Broadway. It consists of a cylinder ten feet in length, upon which are securely fastened seventy-four brush brooms, each three feet in length, which run transversely under the body of the machine, which is simply a slight frame work resting upon four wheels. The brooms are attached to the cylinder at an angle of forty-five degrees, so that as it revolves a clean sweep of nine feet is made at one movement, and the dirt is thrown up in a winrow at the side of the street. The motive power is conveyed from the axletree to the cylinder by two cog wheels. By a simple arrangement of a lever and two screws at the top of the machine, the brooms are raised or depressed almost in an instant, and the machine works itself in and out of gear. It is estimated that one of these machines will do the work of 300 men, and do it better than by hand.

Fast Steamboat.

Dr. Rich also read a statement of the fastest steamboat time on record, giving an account of the speed of the Hudson River steamboat Mary Powell, having made the run between this city and Poughkeepsie, on Friday, June 12, in three hours and forty-two minutes. Leaving here at half-past three o'clock P. M., she reached Poughkeepsie at twelve minutes past seven, deducting thirty-five minutes consumed at landings and five minutes lost in getting into the stream on starting, and the actual running time for the seventy-five miles is three hours and two minutes, a feat unprecedented in the annals of Hudson River steamboating, which has always far exceeded any time made on the waters of the old world.

Mr. Dibben.—The Mary Powell was built the year before last, and her engines were made by Fletcher & Harrison. There is nothing peculiar about her, except that her engines are well made and her machinery throughout has been carefully constructed. I have been with her two or three trips, and there is no doubt but she is a fast boat. But twenty-four miles and some fractions of a mile an hour, have been made by some two or three boats on the Hudson river. There is no mention, in the case of the Mary Powell, whether the wind and tide were in her favor, which would make a difference of some two knots an hour in her speed.

Experiments with Steam.

Dr. Warren Rowell.—As one of the committee appointed a few evenings ago, to consult with the commissioners appointed by the Navy Department, to conduct a set of experiments in relation to the utility of using steam expansively, I have seen Mr. Horatio Allen, one of the commission, and have spoken with him on this subject. He proposes to construct an engine to be used throughout the experiments, so arranged that the cylinder can be enlarged or diminished, while all the other parts remain the same, so that by first using the small cylinder, and afterwards increasing its diameter, while the friction of the other parts are the same, it is hoped the economical results of using steam expansively will be fully tested. Mr. Allen at first thought of using the centrifugal pump as a measure of power, but on consultation it was decided to employ a series of fan blowers, which by adding one after another, the resistance could be increased with greater uniformity. These experiments are to be conducted with great care, and will occupy about a year.

MEASURING INSTRUMENTS.

The subject continued from the last meeting was then resumed.

BODY MEASURE.

The Chairman.—The principal instruments for measuring the size and form of the human body have been devised for those engaged in making clothing. The height of the body and the dimension of its various parts are usually found with the ordinary rule and measuring tape graduated in feet, and sometimes as fine as the thirty-second part of an inch. Many patents have been taken out in this country for measures used by the tailor, and those who have a taste for Descriptive Geometry, will find in this direction a new and practical application of favorite problems. It would be impossible to notice in detail any of these improvements, the aim of which is to form a garment which fits the body when at rest and in motion, and still conforms in every particular to the prevailing fashion; but those interested in this branch of technology are referred for further information to Genio C. Scott, who has been for many years a publisher of fashion, and a member of the Parisian society, where most of the changes in gentlemen's clothing originate.

FOOT MEASURE.

The common rule used by bootmakers in measuring the foot, is graduated into thirds of an inch, which are called "sizes." The measurements around the foot are usually taken at three points, by means of plain paper, which is given to the cutter as his guide. It is evident that this kind of measurement is very defective. It arises from the custom which demands that the foot, more than any other part of the body, shall conform to certain shapes, devised and established by the bootmaker, generally with the full consent of the wearer, who is anxious that his foot should always be presented to the public in what is regarded as the approved form. This practice is the cause of great pain, and often results in the permanent deformity of the foot. Whenever each person will consent to wear shoes which more nearly approach the shape of the foot, it will be comparatively easy to introduce measurements similar to those now used in the most approved hat stores for ascertaining the true form of the head.

HEAD MEASURE.

The hatter has long measured the head according to sizes; always assuming that the line of contact between the head and hat described an oval. Of course, those persons having a large development of comparison and concentration, to use the language of the phrenologist, found this oval was never long enough; while those having excessive acquisitiveness, secretiveness and combativeness, were most positive that the oval was never made broad enough. The true oval will seldom, if ever, make a perfect fit. This defect was remedied some years since by an ingenious Frenchman, who devised an instrument called the conformater, which shows the true shape of that part of the head in contact with the hat. It is, in appearance, like an ordinary hat; the sides being composed of a series of adjustable levers, arranged with springs, so that when the machine is placed upon the head the levers conform to it. To each lever is another running inward, and having upon its top a metallic pin, so that these levers show a series of pins, having (on a much reduced scale) the shape of the head. On to these a paper is laid, and the crown of the hat, which swings on a hinge, is then brought down upon the paper, by which means the pins impress upon it the exact shape required. With this form before him, it is an easy task for the ironer to change a fashionable hat into a perfect fitting one.

DYNAMOMETERS.

The study of physiology has increased our desire to know more of the vital forces, and consequently to ascertain by correct measurements the actual power of the various parts of each individual. An instrument of the dynamometer class is now much used for measuring the strength of the limbs. It is so arranged that the power applied moves a strong spring, and, at the same time, an index hand over a circular graduated scale, on which is marked in pounds the force exerted. All measurements of this kind must be accompanied with measures of the size and form of the person, from which is deduced his proportionate strength.

The lungometer is an instrument for measuring the pressure of air which a person can exert by means of his lungs. This requires no additional measure of their size. The last remark also applies to a delicate instrument invented in France, for measuring the strength and rapidity of the pulse.

CRANIOMETER.

The craniometer is an instrument for measuring the size and form of the head for scientific purposes. It consists of a semi-circle, on opposite sides of which are movable graduated bars. As this device can only make a measurement in one direction at the same time, the process to completion is tedious. A modification of the French machine used by hatters might be made, so as to give a projection of the outlines around the head, horozontally and vertically, so as to include the cerebellum; also, two intermediate outlines, and a transverse line showing the relative position of the ears. These projections would save a vast deal of uncertain manipulation on the part of the phrenologist, and be most satisfactory to the person examined. Besides, they could be preserved and compared with later measurements, and thus settle the vexed question with regard to change in the form of the skull.

Aside from the practical and every day use of all the measures referred to, as applied to an individual, they are of great significance as applied to the race. The profound investigations in ethnology will result in the demand for all observations possible regarding the physique of man; and, the more perfect they become by measurements, the more rapid will be the unfolding of the greatest mystery connected with the development of races.

Dr. Rich.—The subject of the measurement of the size, form and forces of the human body is a very important one, and to which, as yet, little attention has been paid in this country. It is not so in Europe. The pupils of the schools in England are measured, and much interest is taken in the testing of physical strength. This is also done in the larger schools of Paris. I was much interested while there, several years ago, in witnessing their method of measurement, and I have had the honor of having my system adopted in their schools.

Mr. J. Johnson.—I have seen it stated that measurements of the human body have been made by the photograph. The person being placed on a revolving stand, pictures are taken in different sides and positions, from which the size and shape of body can be accurately determined.

Mr. Benjamin Garvey.—I should think, Mr. Chairman, this style of measurement would be very defective, as the photographic process can give no actual measurement, but merely an outline of the body; and in taking the size of the head the hair will prevent any just conception of the size of the skull; and there is no rule by which this error can be eliminated. Nothing, in my judgment, will answer but an instrument that will measure the shape, size and sinuosities of the head and body, so that degrees of comparison can be instituted with individuals of different nations.

Dr. Rich.—I saw in Paris, some years ago, a very ingenious instrument for measuring the form of the body. It was made something like the conformater used by hatters for measuring the shape of the head. It consisted of a series of pins, which were acted upon by screws so that the pins could be elevated or depressed to the slightest curve. By this instrument we were able to get a most accurate outline of surface of busts and other unequal surfaces, but it was used chiefly for taking very remarkable curvatures or deformities. I used it myself, in taking curvatures of the spine, and I found it exceedingly accurate.

The Chairman.—The same principle was applied by Mr. Hamilton Towle in his instrument for measuring the curves of the bottom and sides of vessels while in the water, so that when the vessel is placed on the stocks for repairs, corresponding props to suit the curves can be placed underneath, thereby avoiding any strain to the vessel or machinery.

CEPHALOMETER.

Mr. Enos Stevens exhibited his cephalometer, for measuring the size, curves and angles of the head, and showed several charts of the heads of prominent public men taken by this instrument. He said that some important facts had been developed by this machine in taking the measurement of the heads of the inmates of the Idiot Asylum in Boston, which, at the suggestion of the Chairman, Mr. Stevens said he would embody in a paper to be read at a future meeting.

Mr. Garvey.—This cephalometer appears to be well adapted for the purpose intended. It can be used not only for measuring the heads of the living, but also of those who have lived centuries ago, to contrast them with those of the present day; for there are to be had the skulls of those who lived some thousand years ago. A comparison of the head and size of the brains of those who flourished in ancient with those of modern times, would be very interesting.

HYDROMETER.

Mr. A. R. Callo described Mr. Tagliabuê's hydrometer, and showed some experiments with it. He said that the greatest density of water was between 39 and 40 degrees of the Fahrenheit thermometer. From this point the comparison is made of the specific gravities of different liquids, allowance always being made for the temperature of the atmosphere at the time, as the cold of winter condenses the fluid, and increases the specific gravity, while the heat of summer expands the liquid, and causes a diminution of its specific gravity. Alcohol and water unite in every proportion, and the combination is attended with a decrease of volume, so that a mixture of 100 gallons of alcohol and 100 gallons of water, will make but 196 gallons altogether. The density of the mixture increases when the water is in excess of the alcohol; hence the strength of the spirits may be estimated by its specific gravity.

Mr. Garvey.—From the slight cohesion of the particles of fluids, and the ease with which they slide over each other, the inference is that they must be small, smooth and globular, and if they are round there must be spaces between them, in the same manner as there are spaces between balls. In a like way a certain quantity of sugar may be taken up in water without increasing its bulk, and afterwards salt may be added to it and its bulk remain the same; by admitting that the particles of water are round, this is easily accounted for. From the mixture of 100 gallons of water with 100 gallons of alcohol, we do not get 200 gallons, as the water seems to fill in the spaces between the alcohol, and we get less than 200 gallons.

Dr. Rowell.—A soda water fountain that holds 10 gallons, when filled with carbonic acid gas of 10 atmospheres, or 150 pounds pressure, will allow 9 gallons of water to be pumped into it, and there will still be but 150 pounds pressure. The idea is that the water absorbs the carbonic acid gas.

Mr. Dibben.—It is well known that carbonic acid gas when at rest, is absorbed, but if shaken up, the pressure will be increased.

Mr. J. Johnson.—It has been stated that 30 different gases can be combined together, and yet the pressure will remain the same.

On motion of Mr. Dibben, the Association adjourned to the 3d of September.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
September 3*d*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Enos Stevens.

After a few remarks from the Chairman, on the influence of fairs, on motion of Mr. J. Bull, the meeting adjourned to attend the fair of the American Institute, opened that evening at the Academy of Music.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
September 10*th*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Thomas M. Adriance.

Dr. R. P. Stevens read the following paper on the

ORIGIN OF THE HUMAN RACE.

The endowment of matter with the prerogative of life, and the transmission of it, in a succession of varied phases, through successive generations, is one of those mysterious questions, which owing to the absence of the necessary data for a successful solution of the question, or the limitation of his powers, may never be definitely settled by MAN.

The interest attending any attempts to solve the mystery may well excuse the philosopher, who steps aside for a brief space from his severe and more certain studies, and wanders for a season on those shadowy confines separating organic from inorganic matter, and which presents the organic to us in new types and phases.

These dim confines once passed, the inanimate having once assumed the animate, the latter appear in higher and successive phenomena, until *man* is the culmination; while the inanimate remain undergoing a round of decomposition and recomposition of pseudomorphs and metamorphs, but ever essentially the same.

Why should that succession of phenomena, which we call life appear in the form of orders, classes, genera and species, when individuals are grouped together according to their apparent similarities? Why should species be reproduced and perpetuated? What is the cause or causes of their generation? What is the primal influence deciding the difference between individuals by means of which we distinguish one from another, and which become the characteristic marks of species? These questions are collateral and incidental to the great question of LIFE.

Have groups of individuals, which we term species, possessing certain characteristics, essentially distinct from other groups of individuals, and which characteristics are capable of being transmitted from parent to posterity, been derived from a common *progenitor?* And by tracing back the line of succession can we find a *single* source of life? A *common* parentage to all species? Were the specific characteristics of the first born of each new species, impressed upon it by its immediate ancestor while *in utero? or ova? or at conception?* Or were they developed within itself by the necessities of its conditions, surroundings, and growth? Or were the eldest born of each species, a distinct creation, by a power outside of, superior to, and beyond all matter and modification of matter?

The last great theorist upon these questions, answers the first, by saying, that he can trace all existing species to a few common progenitors, and has no doubt, that if all the facts and discoveries in geology and palæontology were collated he could find a *common parentage.*

To this question, in the light of American geology, I purpose to address myself; first premising that the Darwinian Hypothesis explains very satisfactorily, many of the puzzles of existing varieties as modified by the plastic power of man. Its great defect, I consider to be, that it makes *death* the conservator of species, in this "struggle for existence" theory, while life, I think, should be considered the grand conservatory force in animated nature.

Parenthetically, I may remark that Darwin, the author of "The Vestiges of Creation," and all writers of the development school, ignore the great negative arguments against their theory, derived from palæontology.

The true theorist should so weave the fabric of his brain, that while the positive enters into the warp the negative should not be forgotten in the woof.

What is the argument from palæontology? We would broadly state it thus. In all the stony records of the past, there has been progression in animal and vegetable life, and this progression has proceeded *pari passu* with the formation of large islands and continents, the relative increase of dry land over the domains of the ocean. When the ancient record fails and living succeeds, we find the greater number of individuals and species in the present era, because of the larger territory of dry land as compared with any previous geological epoch, and consequently of the greater capacity for the support of its inhabitants. Of existing species it may be said, that each continental and insular area, has a provincial fauna and flora peculiar to itself, and while some features are common to many, none are common to all.

In this respect agrees each great epochal division of ancient fauna and flora. We may cite as an instance, that the *Athyris subtilita* (Hall), a carboniferous brachiopod, is common to all the ancient carboniferous seas; it is found in India, Europe, England, North and South America. Yet each of these great geographical divisions of the coal measures, has fossils which are peculiar to itself, and not found elsewhere. This truth is confined to more limited areas. Pennsylvania has fossils not seen in the fauna of Illinois, and the latter not in the former.

The carboniferous formation marks a grand epoch in the biological history of the earth. The old then in part was buried; the new began to appear. The promise of a more glorious future shone brightly upon its horizon. Previously the flora had mainly been marine, or confined to the sandy beaches of the shallow seas, and consequently the land fauna were extremely meagre. In this epoch, great carboniferous continents were formed; the land was clothed in arborial verdure; flowering plants adorned it with their beauty; insects were allured by their odor; air breathing animals fed upon its fruits and reposed in its shade.

Let us compare the primordial with this meridian flora. In round numbers, and not including fruits, cones and stems, for these might possibly be a repetition of plants already known by their leaves, we have in America at least 244 species of continental and insular plants. A forest, which in the number of its species, would well compare with many provincial forests of the present era.

This forest, so far as known, was peopled with six species of reptiles; three or more of insects, and two of pulmoniferous gasteropods. None of its inhabitants, and not one of its species of trees and plants, were known in the primordial, or even in the later silurian. In all of its flora there does not appear any evidence of a "*gradual development*," for one of its earliest trees was a fruit bearing one, and it closed with none higher.

We have prepared a table* in which are enumerated all the plants and animals of the primordial, and collated in columns with the carboniferous above the coal conglomerate, or mill-stone grit. If we had added the flora and fauna of the sub-carboniferous, the increase of the number of species would have been much greater, and the argument correspondingly stronger.

Analyzing this table, the following facts are presented: The carboniferous seas had of Annellidæ 2 gen. and 3 spec; of Foraminifera 1 gen. and 1 spec; of Corals 6 gen. and 16 spec; of Echinoderms 9 gen. and 22 spec; of Cephalopods 7 gen. and 48 spec; of Gasteropods 27 gen. and 108 spec; of Brachiopods 13 gen. and 107 spec; of Conchifers 27 gen. and 94 spec; of Articulata 4 gen. and 8 spec; of Fish 13 gen. and 22 spec; of Reptiles 4 gen. and 6 spec; and of Insects 3 gen. and 3 spec.

Many of the genera are new. They were not known in the earlier seas. The following genera have, however, descended from the primordial, viz: Annellidæ 1 gen.; Cephalopodæ 3 gen; Gasterpodæ 10 gen.; Brachiopodæ 6 gen; and Conchiferæ 3 gen. Per contra; the following, from the Primordial, have been lost by the way, viz: of Protozoa 11 gen. and 68 spec; Zoophytæ 1 gen. and 2 spec; Echinodermatæ 2 gen. and 2 spec; Annellidæ 2 gen. and 22 spec; Cephalopodæ 7 gen. and 48 spec.

Cephalopodæ 1 gen. and 2 spec; Gasteropodæ 5 gen. and 22 spec; Brachiopodæ 7 gen. and 17 spec; Conchiferæ 9 gen. and 7 spec; and Articulatæ 12 gen. and 48 spec. The number of the deaths have exceeded the births, by 5 genera and 152 spec., or 50 per cent. of the gen. and *all of the species.*

During the immensely wide interval of time elapsing from the first introduction of life into the primordial seas, to this period of dawn of the present, there have been added to the number of the genera already known, to the Annellidæ 2 gen. and 3 spec; Foraminiferæ 1 gen. and 1 spec; Zoophytæ 6 gen. and 10 spec; Echinodermatæ 7 gen. and 48 spec; Gasteropodæ 16 gen. and 108 spec; Brachiopodæ 6 gen. and 107 spec; Conchiferæ 24 gen. and 94 spec; and to the Articulatæ 1 new family, 3 new genera and 8 new species.

To this view of new creations we must add 3 new orders, having 20 genera and 31 species. The total number of births exceeds the deaths by 3 orders: 1 family, 90 genera and 429 species.

Does this look like death being a conservating force? What plastic power has it evolved to create the new and more glorious? Where does the theory of "the struggle for existence" derive any substantial support? The voice of nature is "behold! I create all things new."

But the Darwinians may say, "You select for your comparison too wide an interval of time, extending through innumerable years of palæozoic life, and during this interval you know not what developments might have taken place."

We will narrow our limits of comparison, by leaving out of our calculations two grand epochs of geological time, and of biological data, viz: the sub-carboniferous and devonian, and prepare a table (No. 2,) comparing and collating the primordial with the middle and upper silurian, remarking that the boundary between the two is more shadowy and dimly defined than between the later silurian and carboniferous, for the appearance of fish and reptiles in the latter give a line of demarkation apparent to the most superficial observer.

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* The tables referred to do not accompany this report.

Examination of this table shows the following genera and species descending from the Primordial into the succeeding Silurian, viz: of marine plants the Pirimordiæ had 5 gen., 2 of which were continued into the silurian seas; of Protozoa 11 gen., 2 of which passed onwards, and 68 species, 2 only surviving the changes attending the laying down of the Potsdam S. S.; of Annelidæ it had 3 gen, 2 of which were continued; of Bryozoa 1 gen, which was continued; of Echinodermatæ 2 gen., with 1 continued; of Cephalopodæ 4 gen., all continued; of Gasteropodæ 17 gen., 15 of which were continued; of Brachiopodæ 12 gen., all were continued; of Conchiferæ 9 gen., 5 of which descended; and of Articulata 12 gen., only 1 descending into the Silurian.

There have been lost in this earliest period of transition from one epoch to another, 32 genera and 255 species.

Let us now examine the table in another light, looking for the new creations. This table of Silurian Fauna exhibits only that portion of it which is intimately associated with the primordial, often reposing upon it, and never separated from it but by a few thousand feet.

The Silurian has of plants 1 new gen and 7 spec; Protozoa 5 gen. and 16 spec; Annellidæ 2 new spec; Foraminifera 3 gen. and 11 spec; Bryozoa 11 gen. and 34 spec; Echinodermatæ 39 gen. and 102 spec; Cephalopodæ 10 gen. and 128 spec; Gasteropodæ 9 gen. and 144 spec; Brachiopodæ 6 gen. and 178 spec; Conchiferæ 11 gen. and 85 spec; Crustaceæ 31 gen. and 111 spec; and of Tunicatæ 1 gen. and 1 spec.

The sum total of two new orders, 138 new genera and 863 new species. The excess of births over deaths, of two orders, 108 genera and 608 species.

As in the carboniferous, so also in the silurian, the argument from Palæontology is negative against the Darwinian hypothesis.

The gradual development theorists may reply, by saying, that between the primordial and middle silurian, there was a long interval of time—quite long enough to establish their position of the evolving of species by a struggle for existence—"For the rocks," they say, and truly so, "are filled with the exuviæ of the ancient dead. An innumerable host; and during this multiplication of the number of individuals, in this wide lapse of time, there may have been a lineal descent of species from a common ancestry."

To this insidious and argumentative inquiry, we answer: We may go back to the earliest of American fauna—as low down in the Taconic rocks as Dr. Emmons has discovered any evidence of palæozoic life, and here, on the very first tablet of the stony record, side by side, as if cotemporaneous in life and death, lie Zoophytæ, Cephalopodæ, Gasteropodæ, Pteropodæ, Brachiopodæ, Conchiferæ and Crustaceæ, with marine plants. A fauna, quite sufficient to supply carbon to the plant-life, and a fucoidal flora, equally sufficient to supply oxygen and phosphorus, with sustenance to the animal life.

We may also add, that knowing the food of existing species of the same genera, we may safely infer that the waters swarmed with infusoria and animals of soft parts that could not be preserved to us, and that in those early seas there was a crowded population from the first period of palæozoic life.

It may be said that the Echinoderm of the silurian sea is a higher zoophyte than the Palæotrochus of the Taconic, and that the latter may be the progenitor of the former.

We might admit the former part of this proposition and safely deny the the latter. The Darwinians must show the intervening and connecting links in their scale of development, or we must deny the assumption.

Moreover, we can assert that from chemical analysis, and from microscopical examination of their exuviæ, the individuals of the primordial fauna were as perfect and as elevated in the scale of existence as any individuals of similar genera of the present time.

The struggle for existence theory, then, being set aside, what is the hypothesis we would introduce in relation to species? Before proceeding let us give a definition of species, which will meet our views of the subject under discussion. By species we understand anatomical and physiological differences between individuals apparently similar in their characteristics, which are capable of being transmitted through successive generations to their posterity. These different characteristics, often very minute, are manifested by special functions.

A five-finger man we should not consider a new species of the genus homo, although the anatomical features of the digitals are essentially different from the normal hand, because the *extra* member appears to be useless, and may be dispensed with, without injury to the possessor. Neither would we consider mere color a foundation for species, unless it can be shown that some new or peculiar function is the accompaniment of it. The Ethiop is a mere variety of the human family.

So, too, of the lower animals. Take the gallinaceous, for example. A barn yard full of five-toe fowls would not make the beginning of a new species, unless it can be shown that the extra member has a specific use, or that the fowl had other and peculiar powers in consequence of it.

The whole race of barnyard fowls, from the little strutting bantam to the overgrown shanghai, we should consider but mere varieties of the species gallus, very obviously and naturally the result of the promiscuous concubinage of the male with his harem.

The crow and raven would come nearer marking our difference of species, for though the two are in plumage, and anatomical structure similar, yet they have instincts which are unlike. Structurally, a small raven might be called a large crow, or a large crow a small raven. The raven lives upon the borders of civilization; the crow is the scavenger of cultivated fields, a dweller among men. They never commingle. A crow is a lone bird among ravens, and the raven among crows. From the earliest history of our country they were different birds, so that the crow is not the semi-domesticated raven.

If we knew the economical functions which the lower animals perform, we should have clearer conceptions of radical and essential distinction between species; and it seems to me the more we push our investigations in this direction the more certainly shall we arrive at satisfactory results.

To appreciate the theory I wish to present, the following illustration is introduced from the labors in organic chemistry of an eminent American savan:

A portion of primitive rock was taken and triturated to a fine powder. To this was added the ash of lichens growing upon the rock, thus forming artificial soil. In this soil he placed the seed of plants higher in the scale of vegetation than the cryptogamia. This he did repeatedly, each time ascending in the vegetable scale. Clover was finally introduced; afterwards he grew wheat. Now man, the highest of the animal scale, could not have derived his sustenance from clover or any of the plants low in the botanical scale; but the cereal, the highest of the seed bearing plants, is, in temperate climates, his chief source of food. All the way up from lichen to wheat, some lower mammal is adapted to live upon each lower plant.

Still further to illustrate our hypothesis, let us suppose that, primarily, there was a single species of plants created, and this of the lowest type—a mere cell, capable of eliminating oxygen from carbonic gas, and solidifying carbon into vegetable tissue. At the same time the simplest type of phytiferous animals was created capable of inspiring oxygen, and throwing off carbonic acid gas. We already know enough of the physiology of life to decide that these two would be mutually dependent upon each other. The plant absorbing carbon, yielding oxygen, and giving food to the animal, the latter absorbing the oxygen, throwing off carbon, and bequeathing its dead and effete organism to enrich the soil for the growth of future plants. Let us suppose a carnivorous animal to be introduced; we have now an animal a little higher in its powers than the vegetable feeder, and remotely dependent upon plants for its sustenance. We are sufficiently acquainted with the grand laws of nature's economy, growth, supply, redundancy and waste, to know that a new and another species of animals must be introduced, which we will call scavengers, in order the first circle of life may be complete.

The creation of a plant involves the necessity of *three* species of animals, performing as many distinct functions, to be created simultaneously, in order to preserve the continuation of life, and the harmony of its phenomena.

If there had been a blind force operating upon matter, which at some happy and auspicious moment developed life out of the inanimate, and from matter gave a vegetable cell, how could it have proceeded further? What direction should this blind force impel its power? If death then began its reign, whence the conservating force to develop an animal?

We cannot conceive of a circle of life, composed of varied members, each mutually dependent upon each other, acting in harmony, each in its own sphere, to carry forward and preserve some important and noble result, without supposing intelligence directing the power, a forehand design to be accomplished by the force employed in creation.

All monads are alike dependent upon currents in the water to bring them ood. We cannot assign to so low a form of life, sagacity, instinct, or capacity to select, simply a capability to receive such sustenance as the currents might bear to them in their flow. If there was at any time a failure in the supply of food, this lack would cause degeneracy, and instead of a "struggle for existence," developing new powers in any individual, there would have been loss of vital power from exhaustion, and finally death.

For the sake of our argument, grant that man was the ultimate design in creation. A position to be assumed, though easily susceptible of demonstration. A *monad*, *vibrione*, or *bacteria*, will be at one end of the scale, and *man* at the other ; between the two, and filling up the scale, there will be an indefinite number of circles of life, composed of innumerable number of individuals.

The organic forces developed by growth in the lower circles, by their death, as we have seen in the vegetable illustration borrowed from our savan, prepared the way, and made possible the higher circles.

It was the *conservation of force* in the lower and inferior, that gave the possibility of the high and superior.

The theory, then, to which we incline, is this. Inasmuch as matter had no inherent power to take on the force of life, but that this force was conferred by a power without and superior, so in the further and higher exhibition of this force, the same power interfered to carry forward the law of "progression from the simple to the complex," the primal to the ultimate.

When the old had become effete, and could no longer advance the onward movement, but by its *conservation of force*, had paved way for the new and higher, and made it possible, at wide intervals of time in the ages of the past, the *creative power was energized*. New orders were created, new genera multiplied, and new species added to old genera. New circles of life arose within the old, but extending beyond the ancient limits. Each new born performing high and noble functions, until in *man*, thought, and language, the expression of thought, were superadded to the instincts of the vertebrate.

Thought is the crowning and most glorious function of the whole.

Prof. Vanderweyde.—In discussing this subject, we must consider that the balance that is kept up at the present day between the animal and vegetable world, was very different at an early period. The equilibrium is now kept up by vegetation ; oxygen gas composes one-fifth of the volume of the air. The plants under the influence of the sun, decompose the carbonic acid gas, setting the oxygen free, and keeping the carbon for their own use. All the carbon in the trunk of a tree is from the atmosphere. In the olden time, during the coal formation, the atmosphere contained a great amount of carbon, so much so that animal life could not exist in that atmosphere. The coal formation was to purify the air, and the immense amount of coal now in the earth is the result of that purification.

The subject for the evening was then taken up.

WEIGHTS AND MEASURES.

Prof. Vanderweyde.—The subject of weights and measures is an important one. In nearly every town in Europe there is a different system of measurement, and if we travel fifty miles there we will lose considerable in making change, by the different standards of value in each community.

Money is not a perfectly unchangeable measure of value, but it is the ordinary and legal one. It is very essential that we should have a common, unvarying standard of weights, measures and coinage. Though designated by the same name, there are no two countries that have the same weights and measures. For instance, the German mile is nearly six English miles. In France, a mile is 3,025 yards. The Scotch mile is 1,984 yards ; the Irish 2,038 yards, and the Swedish mile 11,700 yards.

In weights there is also a prominent difference. A Russian pound differs from a Zollverein pound by about one ounce, and there is considerable agitation in that quarter as to the method of dividing the pound, whether into thirty-two loths or half ounces, or into thirty parts corresponding to the thirty groschens in a thaler, or into 100, as in some of the States on the Continent.

The English system of cwts., qrs., lbs., is clumsy, old-fashioned and inconvenient. It is very singular that a people so practical as those of this country, adhered so long to the antiquated system which had been found so embarrassing, when, by reckoning at 100 lbs., instead of the cwt., or 112 lbs., the difficulty could be obviated.

The lineal unit has the same embarrassing features. Its division into feet and inches, and then into the pole, furlong and mile, are not suited to the present age. The yard is subject to changes from temperature, but it is the legal standard by which all lineal distances are measured. The pound is the unit of weights, the yard of lengths, and the dollar of value.

Now these all vary, and are therefore not perfect measures; and in very scientific measurements, allowance is made for these variations. The pound changes its true weight when it is carried to different elevations and latitudes, and by changes in the temperature of the atmosphere which surrounds it.

In 1834 our half eagle contained 123.75 grains of pure gold, it now has but 116.1. In 1850 our dollar contained 381½ grains of pure silver, it has now but 345.6.

The French gramme should be employed as the unit by which all coins shall be weighed. This measure does not depend on an arbitrary weight, but is taken from the great earth herself, which furnishes an appropriate metre for a general standard. The circumference of the earth supplies the metre, and the weight of a certain cube of distilled water, at a density of 39 degrees, determines the gramme.

The English and American pound, ounce or grain, is perfectly arbitrary, and dependent on a standard kept by the government. The metre and gramme is a measure which science and skill has determined, and is adopted for the use of all mankind.

The Chairman.—It is well known that in England they do not use the decimal system, and there is consequently a great waste of time by their mode of calculation. If we had the total of all the time lost in reckoning pounds, shillings, pence and farthings, by each individual during the year, it would be found to be immense. The advantages of the decimal system, in use in this country and in France, are readily seen and appreciated here. In the United States our coins have been changed three times, and each time they have been debased. There can be no doubt of the vast benefit to mankind, to arise from a general unity in the denominations and value of coin, and a unity of standard weights and measures.

Dr. Rowell, Messrs. Fisher, Roosevelt, Dennis and Stevens, took part in the discussion, after which "Novelties at the Fair" was selected for discussion at the next meeting. Adjourned.

American Institute Polytechnic Association,
September 17, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Enos Stevens.

Origin of the Coal Formations.

Dr. R. P. Stevens.—Mr. Chairman, I desire to say a few words in connection with the paper I read at the last meeting. The theory has been advanced for a long time that, in that age of the world in which the large coal deposits were formed, the atmosphere was more thoroughly charged with carbonic acid gas than at the present day; and hence, it is inferred that there was a more prolific vegetable growth at that period, and that this accelerated growth was necessary to eliminate the excess of carbon in order that animals might live, increase and multiply.

The origin of mineral coal is a disputed point at the present day. Its vegetable origin is claimed on the ground that the annular growth of several varieties of trees, very distinct, were discovered in it; but the same facts exist in the slates, and we might claim for them a vegetable origin also. Thoroughly carbonized fossil shells and fossil bones are found in coal; why not ascribe its origin to these?

The theory which I advance is one that is adopted by an eminent German chemist, now living in Ohio; and which was formed after a careful examination of the peat bogs of Europe and America. The theory is, that nearly all the coal beds were but ancient peat bogs. Peat, we know, is formed from mosses.

Prof. Vanderweyde.—Where did the mosses that formed the peat obtain their carbon?

Dr. R. P. Stevens.—They got it from the atmosphere. During the carboniferous era, the prolific growth of vegetables passed away in the same manner as that of the present day. There are regions that have been for centuries covered with forests and plants that have flourished and decayed, and the remains of which were never disturbed by any leading force, and still the earth on which they lived and perished is covered with a very small amount of vegetable matter. From this, we infer that the growth of that period when the coal was formed passed away in a similar manner. It is stated, in proof of the vegetable origin of coal, that there has been found submerged wood and peat turning into coal, and its bituminous nature is given to it by decomposed water. But the advocates of this theory are yet undecided whether the bitumen has its origin in wood and water.

The theory which I incline to is, that the atmosphere, in the time of the great coal formations, was precisely the same as at the present day, and that vegetation was exactly the same; for air-breathing animals have lived previous to the coal era, but we have no evidence of the existence of man before that period.

The Super-heating of Steam.

Dr. Warren Rowell.—A few days ago, I made an examination of the engines of the new steamship Scotia, and their method of super-heating. There are seven flues in the boiler, two feet in diameter and fourteen feet long, through which the heat passes. These flues also act as super-heaters. The pressure of steam is about twenty-five pounds, which is super-heated an additional sixty degrees. The scale which forms on the tubes in the boiler is picked off every trip. The engines are side-levers. The economy which is claimed for the super-heater is about seven per cent. I have been informed that a super-heater has been attached to one of the government vessels running from Washington to Fortress Monroe, and that the steam was super-heated so much that the pressure was greater at the end than at the commencement of the stroke.

Mr. T. D. Stetson.—I presume that the conclusion is, that super-heating, when carried to a certain extent, makes up for the loss of pressure at the end of the stroke, and that beyond a certain point there is no economy.

The Chairman.—Mr. Allaire, of this city, was the first to use the steam drum. The question is, whether there is not enough super-heating obtained from this arrangement?

Mr. J. K. Fisher.—By heating steam too much, as in some cases of super-heating, the lubricating qualities of steam are lessened. I have heard railroad men say that when going down hill they shut off steam; and after a time, they say, the engine begins to "howl," as they term it. The brass rings used in the piston are what cut and make this noise. Much of this cutting I attribute to the use of different metals; for, with steam said to be nearly red hot, and cast iron rings used in the piston, the cylinder is not cut. That is, cast iron upon cast iron, I am told on good authority, does not cut. This subject is one that should be carefully experimented upon.

Prof. Vanderweyde.—Two metals working together, if of the same nature, will wear evener and work better than if two different ones are used. A soft substance will cut a hard one, as is seen in boring through glass with copper. The emery beds itself in the copper and acts like teeth in a saw. In the same way, a stone is cut with an iron saw. I had occasion lately to saw a piece of silex in which there was some copper; I found no difficulty in cutting the silex, but, on reaching the copper, the emery left the iron saw and became imbedded in the copper and cut the saw.

Dr. Warren Rowell.—I have been told that they sometimes find in locomotive cylinders, within the piston, fine balls of something that resembles charcoal. This would appear to be derived from the carbonization of the oil. At 310 degrees, vulcanized india-rubber is decomposed, and, in super-heated steam, a much higher temperature is used.

Prof. Vanderweyde.—The iron may have much to do with this carbonization of the oil. Metals have an effect on the oil, and may decompose it. I have no doubt that in locomotives, where they use a very high temperature, the oil being in close union with the metals, chemical decomposition takes place. The metal of the boiler will have an effect on the oil, the same as nitric acid will have upon copper. Now what nitric acid will do in a few hours, oleic acid will do in a few years; so if time enough is given, we can get the same effect from both.

The subject for the evening, "Novelties at the Fair," was then taken up.

THE GLOBE LENS FOR THE CAMERA.

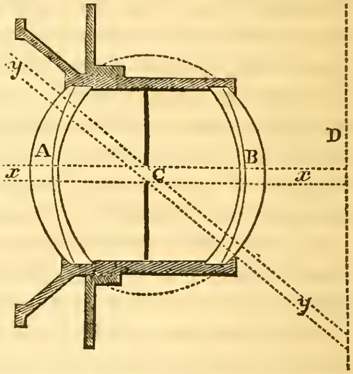
The Chairman.—A very important advance in the science of optics has recently been effected, for which we are indebted to Messrs. Harrison and Schnitzer, of this city, who have constructed lenses which can copy straight lines. It was supposed that this could not be done, but we have the fact before us. Maps are correctly copied by this instrument. It is used in the office of the Coast Survey. These lenses are on exhibition at the fair, and also photographic pictures taken by them. They have been sent to Europe, and we have the satisfaction of hearing the artists there admit that they produce the much desired effect of an exact copy without perceptible distortion.

Prof. Vanderweyde.—Many here no doubt recollect when the daguerreotype was first discovered; the large lenses that were used in the camera, and that to make any kind of a sharp picture, diaphragms of very small apertures had to be employed. These lenses were principally plano-convex of some three or four inches in diameter. After these came the achromatic lens, made of flint and crown glass. In this style two achromatic lenses were used, the front one being cemented together with balsam of fir; and in the back lens the flint was separated from the crown glass by a ring about an eighth of an inch in width. These lenses have been in use for the last fifteen years. But the great problem to be solved was to do away with spherical aberration. Some years ago Prof. Petzval, of Vienna, made a series of calculations with a view to eliminate this defect in lenses; and singular as it may appear, the theory which he deduced from these calculations is the same which Mr. Harrison has now practically carried out. In studying this subject, Mr. Harrison took the hint which nature gives of a perfect lens, the human eye, which, as a piece of mechanism, is unequalled for its beauty and perfection, and forms a perfect camera. The similitude between its principal parts and the contrivances employed for taking pictures is very striking. The human eye is a chamber colored black on all sides except the back part known as the retina, which is a thin white membrane, and receives the image from the lens in front. The pupil acts like the diaphgram, collects the scattered rays, and brings them where they unite in forming a bright and distinct picture of external objects. Mr. Harrison's lenses is nothing more than an artificial imitation of the human eye. Samples of these lenses are on exhibition at the fair; they are about 2½-inch focus. The ordinary lenses, in order to take a picture of three inches diameter, usually have to be of six inches focus.

The following article, by Mr. Colman Sellers, of Philadelphia, fully explains the advantages gained by this lens :

The Globe Lens for photographic cameras, patented by Messrs. Harrison and Schnitzer of New York, is now attracting so much attention and is the subject of such contradictory statements, that a brief notice of it by one who has tried it may not be uninteresting to the readers of this Journal. Photography, with the discovery of the use of collodion, seemed to leap into its present high position at one bound, at least so far as the chemistry of the art is concerned. The negatives of to-day look like the negatives of the first experimenters, and the chemical process of their production is essentially the same. But with the optics of photography the case is different—here there has been a steady improvement. The wants of the portraitists have been met by the construction of new objectives suited to the style of pictures to be produced. In these instruments depth of field with free admission of a large volume of light was what was most sought for. Theory could not dictate what shape or combination of lenses would best produce this result, and patient experiments were resorted to. The requirements of landscape photography are quite different from those of portraiture. A portrait tube may be used to take views if it be provided with a stop or small opening to limit the amount of rays passing through it and thus to deepen the field, or increase the 'reach' of the instrument as it is technically called. This involves loss of light, and consequently diminishes the quickness of its working. We hear continually of rapid or instantaneous photography, and are often led to believe that the rapidity is to be ascribed to some wonderful sensibility of the chemicals used, but this is only partially true, and to the optician is due the most of the merit of instantaneous pictures. A portrait tube with its full opening will, in a sky-light room, produce a picture in perhaps ten or fifteen seconds. This same instrument, with the same opening and same chemicals, exposed to an extended view in bright sunlight, could not be opened and shut quick enough; the immense volume of light reflected from so large an area of space being concentrated on the same sized plate as in the first case, would be too violent in its action, and from the nature of the instrument near and distant objects could not be brought into focus at the same time.

The human eye, when the head is at rest, takes in an angle of view of at least seventy or eighty degrees, the whole of which is not seen clearly at once, but can be examined in detail by the almost unconscious rolling motion of the eye in its socket—the actual included angle of clear vision at any one instant being only one or two degrees. Hence a picture of a landscape, for instance, to fill the eye and seem a true representation of nature, should include an angle of at least sixty degrees. Ordinary instruments, such as have heretofore been used, do not include an angle of more than one-half this amount, and hence has originated the complaint that photographic views represent mere patches of scenery and not pictures. I remember once standing on a bridge—camera in hand—and looking up the romantic Wissahicon. The picture presented to my eye was very beautiful—the centre, a waterfall, framed in on both sides by wild and rugged rocks, and spanned above by the arch of a railroad bridge crossing at the tops of the cliffs. The foreground was made up of a stony bed, where danced and foamed the rapid current. I planted the camera and hoped soon to peel off from this charming view a cuticle (as Dr. Holmes says), which like plates of mica could be split and resplit for the collections of my friends. But on the ground glass I found nought but the tumbling water. No rocks, no bridge, no stony river bed—the poor camera in its empty head was incapable of taking in the whole of the charming picture. One of the dreams of the photographer has been of an instrument which should embrace a large angle and thus satisfy the wants of the eye; but, with the majority of the attempts in this direction came other evils, the greatest of which was distortion of the marginal lines. The aplanatic lens of Grubble is said to comprise an angle of seventy degrees, but in a view before me of Trinity College, Dublin, taken with this lens, there is a curvature of the straight lines of the roof of more than one-eighth of an inch in its length. Mr. Sutton's panoramic lens, a sphere of glass filled with water, includes a very large angle, over one hundred degrees, on the base line, but the pictures are produced on curved plates, which require curved holders, baths and printing frames, and, in the case of architectural pictures, the right lines are distorted, unless the picture be bent to the curvature of the plate upon which it was taken, and thus viewed near the centre of the curvature.



The Harrison and Schnitzer globe lens consists of two achromatic meniscus lenses placed with their concave sides together, and so made that their outer curved surfaces form part of a perfect sphere and the light is admitted through an aperture placed midway between the two lenses, i. e., in the exact centre of the external sphere. The annexed figure represents one of these instruments, A and B being the meniscus lenses, and C the centre opening through which the rays of light pass. The focus of such a lens one and three-quarter inches in diameter is two and one-half inches for distant objects, measuring from the surface of the back lens to the ground glass D. The circle of light produced is five inches in diameter, and from this may be cut the ordinary three second square of a stereoscopic picture. The included angle of light in the five inch circle is seventy-five degrees, and in a three-inch square picture cut from it is contained just four times the area of any instrument I have ever tried, suited to similar work. The remarkable property of this lens consists in its absolute correctness of reproduction. If it is used for copying purposes, the marginal lines are copied as straight as the originals, and, if a copy be made the same size as the original, the photographic copy will, if laid upon the original, match it in every line. I have said that the globe of two and a half second focus will make a circle of light of five seconds diameter. This is when a distant landscape is in focus. If it is used for copying, the circle of light increases in diameter as the object approaches the front lens and the ground glass recedes to focus, so that an instrument which will cover a given size plate for views will cover one of twice the size, when reproducing the size of the original. As the lenses increase in size and length of focus, the plates covered increase in size, and the amount of glass in the lenses bear a larger proportion to the brass work in which they are mounted, and hence the included angle of vision is increased, so that while in the two and a half inch globe the included angle is seventy-five degrees, in a twelve-inch globe (that is one of twelve seconds focus) the included angle is over ninety degrees. It has been said that the light, being admitted through a round hole in a plane plate in the centre of the instrument, must be much more intense at the centre of the field than at the margin, and some writers have stated this fault to be one of great magnitude. Practice however does not show the evil to be so great as they represent, if it exists at all. By reference to the cut, it will be seen, that the dotted lines *x x*, representing a pencil of light of the diameter of the centre opening passing through the axis of the instrument, and *y y* representing a pencil of light passing through the same opening obliquely, doubtless the area of the centre one will be the largest, but as it passes through much thicker glass than the rays *y y*, may not the ultimate effect of each be equalized? I do not pretend to any knowledge of the theory of optics, and must confine myself to facts. In the trial of many of these lenses, of different sizes, I have never found the evil to exist, and all the pictures I have made with the globe lens are remarkable for the even illumination of the field. At the last two meetings of the Photographic Society of Philadelphia, (February, 1863,) the merits of these lenses have been discussed—full credit for correctness of reproduction was accorded to them by all; but the quickness of working was questioned by one gentleman, who stated that in broad sunlight he had exposed an engraving for several minutes and had obtained an under-exposed negative, while all others present who had tried them were unhesitating in their assertions that they were remarkably quick workers when the size of aperture was taken into consideration. A few days ago I placed in bright sunlight an engraving from the London Art Journal, and copied it on a six and a half by eight and a half plate with the same size instrument as was used by the gentleman who questioned its quickness. An exposure of twenty-five seconds gave an impression which flashed up instantly under the developer, assuming great intensity in the light and showing unmistakable symptoms of over exposure, so that I can see no reason why the same law should not hold good with these lenses as with others, viz: that, with the same area of opening to admit light, the shorter the focus the quicker they will work. For interiors, the short focus and large angle of vision possessed by these instruments render them invaluable, and as they are provided with a revolving diaphragm plate in the centre (not shown in the cut), various sizes of aperture can be brought into position, just as the stops under the table of some compound microscopes are arranged, and thus the largest amount of light, consistent with sharpness, admitted.

In the English journals, when the accounts of this instrument were first published, it was denounced in no measured terms, as being constructed on erroneous principles, and the assertion has even been made that its very shape must give fearful distortion to marginal lines, but since it has been proved to be no failure, and its success is no longer an experiment, comes the unwilling acknowledgment: "The principle of its construction must insure correct marginal lines," and last of all comes the declaration that it is "old, very old." Everybody had been making them for years, and there is no merit of invention due to the patentees! Granting that lenses may have been made with an external spherical focus, as is the Sutton case, it will be difficult to produce a lens, made previous to the invention of this now described, composed of two achromatic meniscus lenses combined as these are and producing a like result. The theory of operation and mode of construction of the globe lenses admit of their being readily made of various focal lengths, and thus by the use of a series of instruments, the whole included angle can be made available on any size plate that may be desired; the six inch focus covering a 6½ seconds by 8½ seconds plate, and the 12 seconds focus lens covering 14 seconds by 18 seconds, each including the same angle. One great advantage of short focus lenses, when there is no spherical distortion, is in the appearance of perspective produced. If, for instance, we would view a machine or statue to the best advantage, we stand at such a distance from it as will admit of our viewing the whole of it in the eye at once, and can then best judge of its proportion. If now a picture be made by an instrument of long focus, it will be so far away from the object to be depicted as to make, as it were, too nearly a plane or flat view of it, deficient in perspective effect. With the very shortest focus of this new lens (the 2½ seconds focus), this perspective effect may be too much exaggerated, but with all the other sizes it is not, and with the globe lens and with this only have been produced pictures which seem to me to convey a just idea of size and proportion. Some year or so ago, Messrs. E. and H. T. Anthony published a series of stereographs of Niagara, which seemed to me when I first saw them to bring to my mind all the wonders of the stupendous cataract, and all to whom I have shown them seemed similarly impressed; it was not until recently that I learned that they were taken with the Harrison globe lens, thus furnishing another convincing argument in my mind of the value of the instrument. I can not too strongly urge their adoption by photographers, and am proud of them as originating in America. The shortness of their focus adds much to their portability, as the camera is made smaller than usual, and amateur field photography with the globe lens and dry plates is a pleasure in place of a labor. Its advantages may be summed up in a few words. Short focus, clear definition, wide angle of included vision, absolute correctness of copy on a plane surface, and tolerably quick work. It takes the place entirely of the orthoscopic lens, giving absolute correctness to marginal lines, while the orthoscopic was only approximately correct. It fills all the requirements of a lens for landscape and architectural work, and is wanting only in the one thing of absolute instantaneity of action.

Philadelphia, *March* 10, 1863.

[We may add to Mr. Seller's notice of the "globe lens" that this instrument has been found to reproduce military and other maps and plans with a minute fidelity heretofore unattained; and by their use our army and navy are furnished with photographic copies of manuscript maps and coast survey plans, in which, as appears from the statements of the officers in charge, there is no sensible distortion of the right lines, even on very large plates. Eds. of Silliman's Journal.]

IMPROVED GAS BURNER.

The Chairman.—I saw at the Fair a very useful and simple invention, exhibited by Mr. Burgers, which consisted of a little tube about an inch and a half in length, made to fit over the ordinary gas burner. The upper part of the tube is swelled, and contains a little wool, through which the gas must pass; repeated experiments prove this plan adds to the illuminating power without increasing the consumption of gas.

Prof. Vanderweyde.—There is a slight rarefaction of the gas in this burner, which causes it to consume more oxygen, which gives the increased flame. When little oxygen is consumed the flame smokes, but to produce a good light the flame should be on the point of smoking, and very much approaching a yellow light. The value of the Bunsen burner, used in the laboratory, is that the oxygen is mixed with the gas before burning, the hydrogen gives the most heat, and serves to keep the carbon hot, but it may be heated so that it will not burn at all.

Dr. Rowell.—At the Academy of Music, they diminish the size of their burners, according to the height at which they are placed; on the first tier they have six feet burners, on the 2d, four feet, and on the 3d tier, two feet.

The Chairman.—In connection with the subject of lights, I may state, that in the simple operation of lighting a friction match, it is estimated that one out of every five is lost. The proper way, is, after the match is rubbed and ignited, to revolve it between the thumb and finger until the wood of the match is on fire. The effect of the turning is to heat the oxygen of the air around it, and bring it more rapidly in contact therewith, also to throw the flame beneath the stick. This knack, if generally known, would in the aggregate save thousands of dollars.

The subject of "Novelties at the Fair" was continued for the next meeting. Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
September 24, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. J. Bull.

TRACTION ENGINE.

Mr. J. K. Fisher read the following extracts from the London *Review*, on a traction engine in operation.

The English have no sleeping-cars on their railroads; they lock passengers in at the risk of their lives; and in many other respects they are behind us. But they have beaten us in perfecting a traction engine, which is now in successful operation in one of the great English dockyards. The London *Review* gives the following lively description of this very ingenious and useful machine, which we recommend to the attention of our engineers and machinists:

"Perhaps the oddest, among the many very odd creatures found in Australia, is the animal called the ornithorhynchus, which appears to be a mixture of the duck, the beaver and the mole; and the traction engine, constructed according to the order of the dockyard authorities, and now at work there, is about as strange a medley of half a dozen machines having apparently totally diverse functions. Independently of its traction power—its main employment—it is fitted up as a steam derrick, as a fixed engine to turn the shafting in the workshops, and as a capstan to haul the ships about the docks; and finally, it is now used as a very powerful steam fire engine capable of throwing a jet to the top of the highest ship-building sheds; in short, it can do anything, the dockyard laborers declare, short of talking, and that it can do, after its own fashion, with its steam whistle.

"When we saw it at work, it was removing a huge marine boiler from among the scores of similar monsters stored in the depot. It seemed a marvel how such a bulk of iron could be started at all; but by the use of tackles and blocks it was first hauled clear of others, and then having been lifted by jacks on to the traveling truck, the engine moved off with its load—like an ant removing a grain of corn ten times as big and heavy as itself—along the narrow tracks, in and out the timber and other impediments in its way; round the various docks, without noise or friction, the great load progressed until it finally reached its destination. The weight of the boiler was about eight and twenty tons, which, together with that of the truck and engine, made a total of forty-three tons; nevertheless, it went smoothly over the yard, and, in consequence of its broad wheels, made even less mark upon the paving than would a score of straining horses with their hoofs flashing fire.

"ODD JOBS.

"As an instance of the odd jobs it is put to do, we may mention that a particular balk of oaken timber being wanted from the middle of a stack, an immense number of laborers were told off to haul it out. After many efforts however, they gave it up, when the engine, happening to pass on other work, the driver volunteered to get it out—a work done almost as speedily as the pulling out of a double tooth, an operation it somewhat resembled, inasmuch as the balk of timber was very irregular in form, and must have required an awful tug to extract it from the stack. When any steamer requires any repairs to her screw, this handy jack of the yard goes down to the edge of the dock, fits up its derrick apparatus, and in a few minutes the huge blades of the screw are lifted on to the quay wall. This kind of work is varied sometimes by unloading timber from the ship's side and taking it to the stack; or, with her capstan head, she lifts the heavy chain cables from the holds of the men-of-war; and when the other laborers have done their work, and the huge stationary engine of the yard is at rest for the day, the traction engine comes up, plants herself firmly in the shop where motive power is required for overwork, the band is slipped over her driving-drum, and immediately the whole machinery of a department is at work. She is constantly thus employed in the armor plate shed, and, in consequence of the small expense at which she is worked, compared with the large stationary engine, an immense saving accrues to the public service.

"THE ENGINE CLIMBING HILLS.

"Perhaps the most curious and interesting feature of the traction engine is the arrangement by which she is enabled to climb hills which horses with heavy loads could not attempt, and not only to climb but to descend with equal facility. In order to accomplish this, the driving wheels are fitted with a mechanical arrangement which acts like a cat's claw, in seizing or taking firm hold of the ground. These talons are projected through the rim of the wheel, and are withdrawn with a feathering action like that of a paddle-wheel at the moment they act as an obstruction; they simulate, in fact, the sheathing action of the cat's claw, clearing themselves, at every rotation of the wheel, of the clogging soil. The engine is capable of ascending gradients as steep as one in six, and it has several times been seen, to the astonishment of the townspeople, conveying a 68-pounder gun, weighing 112 cwt., down the Plumstead road, over the steep acclivity of Burrage hill, and returning by the descent of Sandy hill to the Arsenal; a feat which, it is needless to say, horses could not have accomplished. On Woolwich Common, moreover, it manœuvres with three of these ponderous 68-pounders with an astonishing facility.

"PECULIARITIES.

"The wheels of the traction engine are so broad that they do no damage to the ordinary road, and they run without sinking in marshy land and on loose ground, where ordinary wagons would sink beyond reclaim. The ordinary pace of the engine, when carrying a load over broken ground, is about three miles an hour, but it will run at the rate of ten miles an hour; and it has been proved capable of drawing, over a good road, as great a weight as a hundred tons.

"The speed and power of traction, and the low cost at which it works—the expense for the coke not being more than two-and-sixpence per day—point to the great adaptability of the traction engine for lines of metropolitan tramway, or to lines running between towns incapable of supporting a railway with its expensive rolling stock. This engine moves so noiselessly, that if one were constructed specially to run in our streets no horses would be frightened by it, and it may be easily arranged to avoid the escape of steam altogether. However, the extraordinary handiness and compactness of this new power, the ability to turn the power to any kind of work, and the ease with which it is guided by the aid of the steerage-wheel, will, without any measure of doubt, render her the indispensable companion of man wherever great works are in progress, or mighty engines have to be lifted and conveyed from place to place in the ordinary course of the day's work. To the arsenal and dockyard, the engine now at work there is invaluable; and the cost has been so much less than horse power that two teams have already been dispensed with. In the old days of horse traction, it was a common thing to see skilled hands, earning five shillings a-day, employed at mere laborers' work in certain emergencies, for want of a full supply of traction power; now all this is saved by the ever-ready power of this manageable monster, which promises to become the common drudge of man in every field of exertion where gigantic powers have to be called into action."

The Chairman.—I noticed an article in the English *Naval Gazette*, which candidly admits that the Americans excel all other nations in the perfection and manufacture of implements of warfare. Mr. Parrott, who has devoted considerable attention to the construction of heavy guns, makes the one which bears his name by banding a cast-iron gun at the breech with massive wrought iron rings, and thus has succeeded in making the strongest and best gun in use. At the foundry at West Point they have now a thousand men at work, and generally turn out large guns at the rate of one a week, and smaller ones one a day. The development of this branch of manufacture in this country within the last two years, has astonished the world.

Mr. Dawson, in corroboration of the Chairman's remarks, read the following extract:

Astonishing Revolution in Ordnance—New Cannon with a Range of Nine Miles.

The recent work of our siege artillery on Morris Island is without a parallel in the history of warfare. The fact that field artillery and heavy ordnance have reached such perfection is almost incredible. If any one three years since had ventured to assert that guns would be constructed capable of throwing a projectile of three hundred pounds weight a distance of six miles, he would have been considered a maniac, and would probably have been consigned to a lunatic asylum.

Before the first bombardment of Fort Sumter, when Beauregard had been permitted to encircle that fortification, without molestation from its guns, with a series of powerful batteries, mounted with the heaviest guns then used by the army, the Northern people were in doubt as to the ability of Major Anderson to throw shot or shell from his position into the city of Charleston. At this time a letter was addressed to one of the best authorities upon the subject in this country—a person who is now engaged in the present operations against the great rebel stronghold—and the following is an extract from his reply:

Washington, *January* 28, 1861.

Yours of the 25th instant has been received. I am unable to enter into the reasons on which the opinion is based, but believe that a bombardment of Charleston from Fort Sumter by any ordnance now there, is out of the question.

The armament of Fort Sumter at that time consisted of the ordinary smooth-bored thirty-two and twenty-four-pounder siege guns, a few eight and ten inch columbiads, and mortars. The fifteen-inch Rodman gun had been constructed at that period, but only for experiment. They had not been placed in position on any fortification except in the experimental battery at Fortress Monroe.

In the first bombardment of Sumter a small rifled gun, of English manufacture, was used by the rebels with much effect. It was in position on Cumming's Point, near the present locality of Battery Gregg, and is said to have done excellent work against the gorge wall of Sumter, although of small calibre. During the fall of 1860, the state of Virginia was furnished with several field batteries of ten-pounder Parrot guns for State defence. These guns were first used against us at Sewall's Point and Acquia Creek, in May and June, 1861, and at that time gave sufficient proof of their immense power and range by far excelling the long thirty-two-pounder and nine-inch Dahlgren gun in use on board our vessels. At the last engagement with the Acquia Creek batteries, in which the United States steamer Pawnee participated, a small rifle gun was used on board that vessel, which is probably the first instance where rifled ordnance was used by the forces of the United States against an enemy. The thirty-pounder Parrot gun was probably first used at the first battle of Bull Run. During the summer of 1861 a number of eighty-pounder rifles were manufactured at the Washington Navy Yard on the plan and under the superintendence of Admiral Dahlgren. The one-hundred-pounder Parrot gun was first used at the siege of Yorktown and on board the steamer Westfield in the operations of Admiral Farragut on the Mississippi river. Heavy rifled guns were mounted and used in Fort Pickens during the two bombardments of the rebel positions at Forts McRae and Barrancas, and Pensacola Navy Yard. Since then they have come into general use both afloat and ashore, and have been increased in size from the light field gun, throwing a projectile of ten pounds in weight, to the enormous "Swamp Angel" now in battery on Morris Island, which sends a bolt weighing three hundred pounds to a distance of ten thousand five hundred and sixty yards, or six miles.

Thus it will be seen that in the short space of thirty-one months an entire revolution has taken place in the character of ordnance used both in naval and military operations; and where, in 1861, high authority stated that a bombardment of Charleston from Fort Sumter was an impossibility, now is it not only possible, but we can with ease, at a distance far greater, not only destroy Charleston, but compel the enemy to abandon any position he may take a mile beyond it. Indeed, a trial was recently made of a new piece of ordnance called the Ferris gun, and the report states that a range of nine miles was obtained. If this is the case *an enemy's ship will be within range before her hull is in sight above the horizon;* for, on account of the curvature of the earth, the hull of one ship does not come in sight of a person on the deck of another, until within a distance of seven miles.

Such is the range being obtained, that we may expect in a little while to be bombarded successfully by guns entirely removed from sight and out of hearing; enabling us to obtain a knowledge of the enemy's position only from the direction in which the projectiles come. Verily, we live in a wonderful age!

OCEAN NAVIGATION.

Mr. Benjamin Garvey.—Mr. Chairman, the subject of ocean navigation is one that is attracting considerable public attention, it is one that is particularly interesting to us from the fact that our commerce is seriously threatened, and may eventually be driven from the sea, if immediate steps are not taken to remedy existing defects. This nation will not permit its commerce to be run down with impunity. To enable us to maintain our maritime position it is necessary that we should have vessels of greater speed than those now in use, and at the same time by having iron sides, be capable of standing battering for hours. That is what we want, monitors that can be depended on for speed the moment it is wanted. What is to be avoided as much as possible is what is termed pneumatic resistance. When a vessel moves through the water the pressure on its sides forms part of the resistance to be overcome; to partly obviate this our American builder, the late George Steers, adopted the wave line which he said nature pointed out to us, and nothing can now equal that system for speed and safety. If a vessel is lengthened, we diminish the resistance of the mass, but multiply the friction in proportion to the length; we have also the friction of the particles of water itself. Resistance from this cause, however, does not vary with the velocity but is constant at all speeds. But the pneumatic resistance is said to increase in a fourfold ratio with every increase of speed, so in order to get the requisite speed we should construct the bow, bottom and afterpart in such a way as to sail over as it were with the least effort; the bow should be made sharp which will greatly decrease the angle of resistance. I throw out these crude ideas merely to awaken an interest in the subject.

Novelties at the Fair.

On the subject for the evening being taken up, the Chairman made a diagram on the black board, of a powerful press, exhibited at the fair, the peculiar feature of which, he said, was the cone shape of the drum and the spiral groove around which the rope passed that gradually increased the diameter of the drum or axle, thus exerting immense power. This press would no doubt make a good and cheap hay press. The Chinese windlass is constructed somewhat on this principle, and the force exerted is so great that one man can raise all the weight that the props which support the windlass are capable of sustaining. We thus get an immense power, but of course at the expense of time, for the handle of the windlass may be turned several times while the drum will go round but once. This form of power can be applied to a variety of purposes.

Gas Burning Stoves.

Prof. Vanderweyde.—I noticed at the fair several stoves for burning gas as fuel, in one of which the gas is burned through sand. When we burn gas with a blue flame we have less light but more heat. The Bunsen burner gives more heat than the same amount of gas burnt in the usual way; when the combustion is perfect we have a blue flame and then get the maximum of heat; when we burn a small jet we have a blue flame, and this produces as much heat as that amount of gas is capable of giving, but when we turn on more gas the carbon passes out so rapidly that the hydrogen has not time to burn it and it smokes; the best light is got when we have the gas on the point of smoking, and when it is passed through sand the gas is rarified before burning. Heat is only a low degree of light.

The Chairman.—It is now well settled that both heat and light are the results of vibrations of ether or œth; and it is very important that we should speak of them as such. These transverse vibrations are very different from those of air which produce sound by what may be termed waves of density. The manner in which heating undulations are produced by the chemical combination of oxygen with both carbon and hydrogen has not yet been explained. When this is done, we shall be able to construct our heaters on scientific principles and perhaps introduce new means of exciting the undulatory power which have hitherto been overlooked. The attention of the association will be more particularly invited to this subject at a future meeting.

On motion it was decided to continue the discussion of "the Novelties at the Fair." Adjourned.

American Institute Polytechnic Association,
October 1*st*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, John W. Chambers.

Greek Fire.

The Chairman.—There is a general impression that many valuable arts known to the ancients have been lost beyond recovery. Of late this idea has been strengthened by the eloquent Wendell Philipps, whose lecture on the "Lost Arts" has been repeated before large audiences. The people seem to be more eager to hear about what has been lost than to learn what has actually been achieved. Considering their facilities, we are astonished at what the ancients achieved in architecture, but their absolute ignorance of nearly all the chemical elements forbids the supposition that they could have accomplished by alchemy what is now impossible to the modern chemist, who can make hundreds of compounds which are never found in the great laboratory of nature.

The Chinese have had the art of making gun powder for many centuries. It was reinvented in Europe, and Marcus Graecus, near the close of the 8th century, gives the ingredients and proportions used. These substances, charcoal, sulphur and saltpetre, were given by nature herself. It is probable that in pulverizing and mixing these combustibles, their explosive property was discovered by accident. The automatic fire of the Arabian alchemists was a mixture of equal weights of sulphide of antimony, sulphur and saltpetre. The celebrated Greek fire was made by a secret process at Constantinople. but as it was a liquid it probably contained saltpetre, sulphur and naptha, or in the place of the latter some of the liquid hydro-carbons produced by nature. Modern chemistry has, however, furnished us with a long list of explosive and highly combustible compounds.

The reported use of some of these compounds during the late attack on Charleston, S. C., has excited the indignation of the English press. Yet it appears that the British government began ten years ago to make experiments in firing shells filled with inflamable materials, and it is reported were successful in obtaining a substance by which they can cover their foes with a quenchless fire. Phosphorus, bi-sulphide of carbon, and naptha are materials far more effective than anything that could have been known to the ancient Greeks.

Whether our government have used these compounds is unknown, but it is known that a member of this Institute sent a few shells filled with a very destructive inflamable compound, to be used at the south in certain contingencies. They were made at his own expense.

Mr. Geo. Bartlett.—I have heard it suggested that a substance equally as good as the Greek fire can be made from coal oil, that is nitrate of benzole, one of the products by distillation of coal oil, which has a large amount of oxygen in it, and burns very freely.

Mr. Reid exhibited a piece of pure white flint, and inquired if it was very abundant in this country.

Dr. R. P. Stevens.—In Lee, Massachusetts, there are immense quantities. Flint is quartz, and has a granulated fracture, so has limestone, Cannel coal and other minerals.

Transmitting Heat by Mercury.

Mr. Johnson made a diagram on the blackboard of an experiment he had tried with a stove having a non-conducting jacket and a coil inside of 27 feet, containing 45 pounds of mercury. As soon as the fire is kindled the mercury expands and circulates, discharging its heat very rapidly. He said with four pounds of coal he could boil four and a half pounds of water. Mercury has the lowest capacity for heat, and the property of discharging it very rapidly. He was never able, with all the fire, to get one turn or two feet of the coil to show boiling. He measured the temperature by color, according to the known rule in tempering steel. He had never heard that such an apparatus, as circulating mercury, had ever been tried before.

The Chairman.—There would be some difficulty if not danger in using this system for heating, as mercury boils at 600 degrees.

The subject for the evening, "Novelties at the Fair," continued from the last meeting, was here taken up.

Single Thread Sewing Machine.

Mr. James Wilcox, of the firm of Wilcox & Gibbs, exhibited their twisted loop stitch family sewing machine. Mr. W. operated the machine, and distributed several specimens of the work it done. He said:

The great importance of the sewing machine in its hygienic not less than its commercial aspect, is now generally conceded, that it is deemed superfluous to occupy time in discussing that part of the subject. In this country, where early attention was given to their adaptation to household purposes, sewing machines are now scattered throughout the length and breadth of the land, not only in stores, shops and manufactories, where the competition of trade compels their use, but in private families of every degree. Many persons who can ill afford the outlay, wisely consider it is better to do without articles of ornament or luxury, than one that does away with that torment of every household, the family sewing. As the twisted loop stitch and the manner of making it is peculiar, I will endeavor to explain it.

The needle enters the cloth, and as it commences its retraction, the nose of the hook enters the new loop brought down by the needle, which the former loop had previously spread or opened ; the hook next advances, carrying the new loop through the old one, which latter still remains on the looper or the inner portion of the back of the let off, the hook next moves so as to rest against the lip, which latter is nearly drawn up, travels out of the old loop to act in like manner upon the new one, in its turn. The twist given to the thread in forming the loop, has an important influence in strengthening the hold of the thread in the cloth, and also on the beauty of the stitch on the under side ; it will readily be perceived that with a short stitch the seam will be much firmer than if made by the ordinary chain stitch. This machine is a single thread one, and is simple, compact, durable, and cheap. The price of the one here is $45, including hemmer and feller. Allow me here to read an abstract from a very interesting paper by Edwin P. Alexander, Esq., C. E., read before the "Society of Arts and the Institutions in Union," at the one hundred and ninth session, April 5th, 1863. (Published in the April number of the *Journal of the Society of Arts*, London.)

ON THE SEWING MACHINE ; ITS HISTORY AND PROGRESS.

"Impressed with the national and social importance of the sewing machine as one of the most valuable of the numerous labor-saving machines of the nineteenth century, I approach the subject with some diffidence and regret, for your sakes, that abler hands than mine have not been deputed to bring it before the Society.

"Such information, however, as I possess on the subject, I gladly place at your disposal, and if I shall succeed in throwing light upon the nature and merits of this indefatigable little seamstress, I shall consider that my labors have not been in vain. I appear before you this evening, not the champion of any one in particular of the numerous varieties of sewing machines, but rather as an humble exponent of their general construction and *modus operandi.*

"I propose, firstly, to trace the origin of the Sewing Machine ; secondly, to explain the leading features of those varieties most generally adopted ; and thirdly, to lay before you a few statistical returns, showing the rapid development of the art of machine sewing, and its important bearing upon the social well-being of a large portion of the community. * * *

"The various sewing machines now in use may be divided into two classes :

"Class 1.—Comprising all machines using a single thread.

"Class 2.—Those machines employing two or more threads.

"The only machines of any practical utility, under Class 1, are the Wilcox & Gibbs Machine, and the wax thread machines for stitching boot and shoe soles, harness, and other strong leather work. * * *

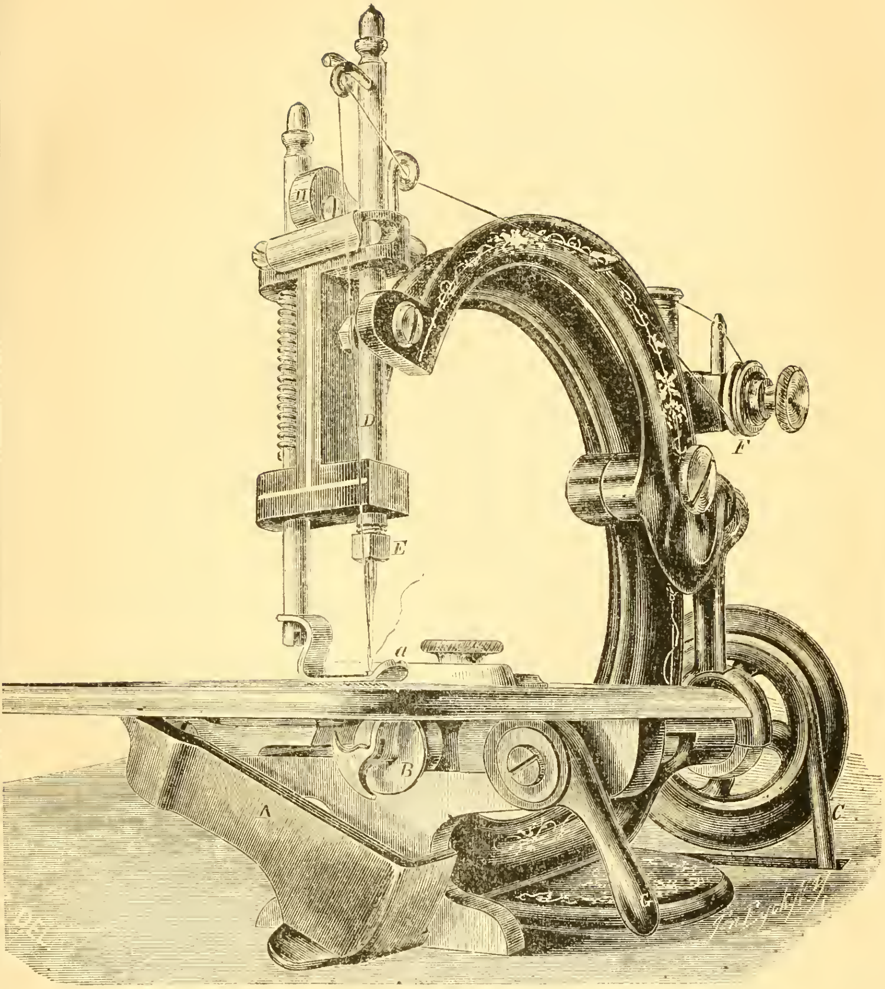
"Many attempts have been made at the production of a good single thread sewing machine, the idea having evidently struck inventors that, if a secure seam could be produced from one thread in place of two, an undoubted advantage would be gained, since the fewer the threads and tensions to be regulated and looked after, the simpler and cheaper the machine. In 1849, Morey and Johnson first brought the chain-stitch sewing machine into something like a practical form, and since that period a host of inventors have worked upon the same idea, but without much success, till, in 1857, Mr. Gibbs, of Mill Point, Virginia, without having seen a sewing machine, and knowing nothing of what had been done in that direction, constructed a rude model of a machine which has proved itself the best of its class. Having been improved and modified by Mr. Wilcox, this machine is now known as the Wilcox & Gibbs Sewing Machine. The sewing is produced by the combination of a straight eye-pointed needle, with *a peculiar rotating looper in the form of a double hook*, having its points in reverse directions. On the stem of the hook is formed a flattened spur, which serves to cast off and twist the loop; a simple form of under four-motion feed, actuated by a crank-pin, serves to propel the fabric, which is held down upon the serrated feeding-bar by a yielding presser-foot. In the operation of stitching, the needle descends and carries a loop of thread through the fabric, which loop is caught by the front hook of the rotating looper, and receives a half turn or twist, the stitch produced being *a twisted chain stitch*, which is more secure than the ordinary chain stitch. The cloth is fed forward, and the needle descends again, bringing a second loop with it. This is in turn caught by the front hook, the preceding loop having in the mean time passed into the throat of the rear hook, which gradually withdraws from it, and allows it to be finally released only when it is nearly drawn up into the fabric. The rear portion of the looper which effects this operation, is called by the inventor the 'tension-let-off,' inasmuch as it maintains a certain amount of tension on the loop after it has in reality been 'cast off' from the looping hook, the object being to avoid any kinking or entanglement of the loop, which sometimes occurs in running at high speeds, if the cast-off loop be left perfectly slack and uncontrolled. *The Wilcox & Gibbs Machine is exceedingly simple in its construction, and is the fastest* and least noisy in its action. It is well adapted to family use, and is largely employed in the trimming trade. It is ordinarily run at the rate of 1500 stitches per minute, but can be worked up to 3000 or 4000.

"I attribute the former failure of the single-thread chain-stitch machines more to the defective construction of the machines (which were frequently liable to drop stitches) than to the stitch itself, as, when properly made, it will answer for most practical purposes."

* * * * *

In order to present the readers of these proceedings with a clear idea of this machine, the following cuts and explanations are added:

Owing to the peculiar construction of the working parts, the machine is rendered perfectly noiseless—a very desirable feature in sewing machines. All the working parts under the cloth plate are covered while in operation by the cap, A, which is hinged at its back end to the frame of the machine by a friction joint. It is shown pulled down in the perspective view, disclosing the feed mechanism and the revolving looper, B. The machine is fastened to the table (which is shown projected only) by a thumb screw from the underside, which screws into the frame of the machine; the latter can thus be readily removed to oil and clean it; to perform this operation it is unnecessary to take it apart, as when the cap, A, is pulled open, the works are all exposed. The machine is driven by a round leather belt, C, which passes over the driving wheel of the machine and down through a slot in the table around the balance-wheel. This latter is prevented from turning in any direction but the right one (indicated by the arrow), or wearing the dress of the operator, by a patented improvement shown in fig. 2, in which A, is the wheel and B, the standard to which is fastened the dress guard, C; a rubber ball, D, fits loosely in a recess and is kept by its gravity in contact with the rim of the wheel between which and the recess it wedges when any attempt is made to turn the wheel backward. This prevents much trouble and annoyance, especially to beginners. The needle used fig. 5, which together with the manner of adjusting is the subject of a



The Willcox and Gibbs Sewing Machine.

Fig. 2

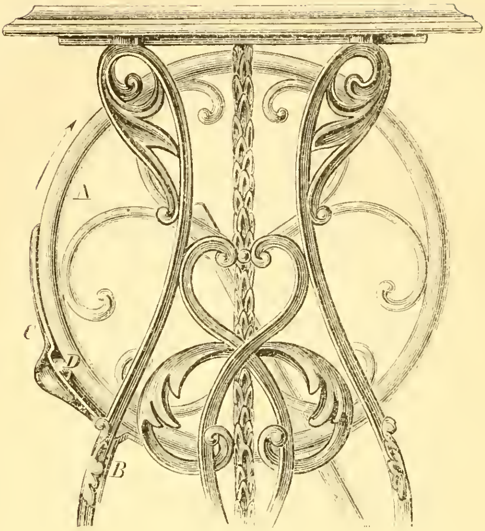


Fig. 5

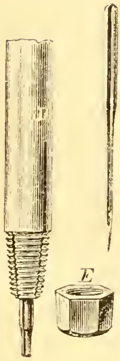


Fig. 3

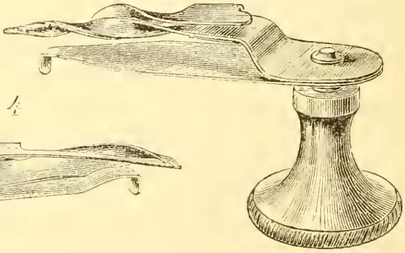
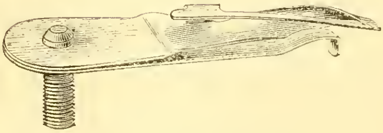


Fig. 4



separate patent, is very short and straight, and is made self-adjusting by means of a groove in its shank and a spline or small steel rib in the hole for it in the needle bar, D, so that it is impossible to insert the needle in any but the right position; the needles being of one length, when they are pushed to the bottom of the hole and secured by the nut, E, are sure to be adjusted properly. The tension on the thread is produced by passing it between two polished glass washers, F, fitted on a screw spindle pressed together by a spring, the pressure of which is regulated by turning the screw. It is very easily understood and managed, and cannot corrode, or get out of order otherwise. The revolving looper, B, by which the stitch is formed, has also been very much improved, and is now a beautiful example of simplicity and perfection in operation.

The hemmer fig. 3, and the feller fig. 4, which are also patented, are quite simple, and at the same time very effective; and it is claimed that they have this marked superiority over any others, in that they turn the hem or fell to the under side, so that the stitch is on the right side of the work. They are also self-adjusting, and it is not possible to set them wrong; they do their work with great perfection and celerity. By means of a groove, *a*, in the cloth presser, (see perspective view,) braid can be sewed on cloth in any desired pattern. The length of the stitch is regulated by the lever, G, and the cloth presser thrown off the plate by the cam, H. The stitch made by this machine is new and peculiar; it is called the "twisted loop stitch," and requires but one thread to form it, producing thereby a beautiful, elastic and durable seam, which is so strong that a piece not half an inch long cut from it cannot be pulled apart. It also has this advantage—that it can be easily removed if desired, by unlooping the end of the thread and pulling on it. As a family sewing machine it possesses many advantages; among which its extreme simplicity and quietness and ease of operation are not the least noticeable.

The same subject was selected for the next discussion, after which the Association adjourned.

American Institute Polytechnic Association,
October 8, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, J. W. Chambers.

At the commencement of the miscellaneous business, Mr. Bull read the following extracts from an article in the *Atlantic Monthly* for October, 1864:

The United States Armory at Springfield.

The United States Armory at Springfield, Massachusetts, is the largest, best appointed, and altogether the most productive establishment for the manufacture of small arms in the world—those belonging to the Austrian Government, at Vienna, and to the British, at Enfield, being greatly inferior both in size and appointments; while the quality of the guns manufactured here is very superior to that at either of those important establishments. Indeed, the Springfield rifled musket is justly regarded as the most perfect arm of its kind which has ever been produced. To attain this desirable point of excellence has required the skill and perseverance of the best mechanical minds which this country—always prolific in inventive genius

—has produced during a period of more than half a century. It would be impossible to estimate the value of these works during the existence of the present rebellion; but some idea may be formed of their usefulness from the fact that twenty-five thousand rifled muskets of the most approved pattern are manufactured at this establishment every month, and the number will soon be increased to thirty thousand. There are, at the present time, one hundred and seventy-five thousand of these muskets in the arsenal, awaiting the orders of the War Department, and the works are daily turning out enough to arm an entire regiment.

When the rebels fired upon Fort Sumter, the armory was making about one thousand muskets per month, and three months afterwards the increase amounted only to three thousand, so little preparation had been made by the government of Mr. Buchanan to meet the great struggle which Southern demagogues were precipitating upon us. Indeed, the number of muskets manufactured during the last year of his administration was less by several thousand than these works turned out during the year 1815; while, during this same period, the residents of streets leading to the railway station witnessed the extraordinary spectacle of a daily procession of wagons laden with boxes of Government arms on their way to Southern arsenals!

Twenty-six hundred workmen are now constantly employed—the establishment being run day and night—and none but the most expert and industrious artizans are to be found among them.

The arsenal, storehouse, offices and principal manufacturing buildings are situated on Springfield hill, and overlook the Connecticut valley at a commanding elevation. The heavier operations of the armory are carried on in another part of the city, about a mile distant, in buildings known as the watershops. These are situated upon a small stream which flows into the Connecticut river at this point.

The armory grounds on the hill cover an area of seventy-two acres, and are surrounded, with the exception of a small square detached from the main grounds, by an ornamental iron fence, nine feet in height. These grounds are exceedingly beautiful, and present every variety of landscape. A beautiful slope to the south and west, covered with luxuriant verdure, and crowned with groves of deciduous trees and evergreens, affords the eye peculiar gratification. The grounds combine also the useful with the ornamental, supplying hay enough to feed a score of horses belonging to the establishment.

There are fifteen buildings used in the manufacture of muskets at the works on the hill, and about the same number occupied as residences by the various officers and head-clerks of the armory. Some of the buildings are spacious and elegant in their construction, particularly the quarters of the commanding officer, and the arsenal, and are arranged in a picturesque and symmetrical manner within the square. The grounds are shaded by ornamental trees, and the dwellings are adorned with gardens and shrubbery. Broad and neatly kept walks, some gravelled and others paved, bordered by finely clipped hedges, extend across the green or along the line of the buildings, opening charming vistas in every direction. Four venerable pieces of artillery, all betokening great age, if not service, standing in the center of the square, furnish the only outward and visible show of the military character of this immense establishment.

The water-shops formerly occupied three different sites, being denominated the upper, middle, and lower water-shops, on a stream called Mill river, which exhibits, in a distance of less than half a mile, four or five of the most charming waterfalls to be seen in the State. In 1817 these works comprised five work-shops, twenty-eight forges, ten trip-hammers, eighteen water-wheels, nine coal-houses, three stores, and five dwellings. These buildings were all constructed in the most substantial manner, of stone and brick, and yet remain in an excellent state of preservation. The trouble and expense attending the transportation of the various parts of the musket from one series of shops to another, however, rendered it desirable to assemble them all in one place, and the location of the upper shops was decided upon as the most advantageous. About eight years ago the work of constructing the new shops was begun. Extensive excavations were made for a new dam, the bed of the stream was changed, the sides being laid for a distance of half a mile with freestone, and the basin raised five feet above its former level. Some idea of the magnitude of these works may be formed from the fact that over one million dollars was expended upon the foundations alone, before a brick was laid in the superstructure.

The first operation is the formation of the barrel. Formerly these were made from the plates of iron called scalps, about two feet long and three inches wide, which were heated to a white-heat and then rolled up over an iron rod, and the edges being lapped were welded together, so as to form a tube of the requisite dimensions,—the solid rod serving to preserve the cavity within of the proper form. This welding was performed by tilt-hammers, which were carried by the water-wheels. Underneath the hammer was an anvil containing a die, the upper surface of which, as well as the under surface of a similar die inserted in the hammer, formed a semicylindrical groove, producing, when the two surfaces came together, a complete cylindrical cavity of the proper size to receive the barrel to be forged. The workman, after heating a small portion of the barrel in his forge, placed it in its bed upon the anvil, and set his hammer in motion, turning the barrel round and round continually under the blows. Only a small portion of the seam is closed by this process at one heat, eleven being required to complete the work. To effect by this operation a perfect junction of the iron, so that it should be continuous and homogeneous throughout, without the least flaw, seam, or crevice, required unremitting attention, as well as great experience and skill. The welders formerly received twelve cents for each barrel welded by them, but if, in proving the barrels, any of them burst, through the fault of the welders, they were charged one dollar for each barrel which failed to stand the test. This method has now, however, been abandoned, and a much more economical and rapid process adopted in its place. Instead of plates of two feet in length, those of one foot are now used. These are bent around an iron rod as before; but in place of the anvil and tilt-hammer, they are run through rolling-machines, analogous in some respects to those by which the railway-iron is made. The scalps are first heated, in the blaze of a bituminous coal furnace, to a white-heat,— to a point just as near the melting as can be attained without actually dropping apart,— and then passed between three sets of rollers, each of which elongates the barrel, reduces its diameter, and assists in forcing it to assume the proper size and taper. The metal by this process is firmly compacted, becoming wholly homogeneous through its entire length.

There are forty men employed, day and night, running the rolling-mills, but, instead of twelve cents, which was paid for welding, they now receive but four cents for rolling a barrel, with the same contingency of a dollar forfeiture for each one that bursts. Four persons are employed at each mill, namely, the foreman, who sees to the heating of the scalps and barrels; the straightener, who straightens the barrel after it passes through the roller; the catcher, who stands behind the roller to catch the barrel when it has passed through, and the fireman. The rollers weigh two tons apiece, and the five sets turn out one thousand barrels per day, one per cent. of which bursts in the proving-house.

The barrel when rolled is left much larger in the circumference, and smaller in the bore, than it is intended to be when finished, in order to allow for the loss of metal in the various finishing-operations. When it passes into the roller, the scalp weighs ten pounds; when it comes from the roller, the barrel weighs a little over seven; when completed it weighs but four and a half; so that more than one-half of the metal originally used is lost in the forging, or cut away by the subsequent processes.

The first of these latter is the boring-out of the interior by machines called boring-banks, of which the water-shops contain a large number, in constant operation day and night. These machines consist of square, solid frames of iron, in which the barrel is fixed, and bored out by a succession of operations performed by augers. These augers are square bars of steel, highly polished, and ground very sharp at the edges, and terminating in long, stout rods to enable them to pass through the barrel. The barrels are fixed very firmly in the boring-banks, the shank of the auger inserted into the centre of a wheel placed at one end of the bank, and a slow rotary motion given to the auger, together with a still slower progressive motion at the same time. By this means the auger gradually enters the hollow of the barrel, and enlarges the cavity as it advances. After it has passed through, another auger, a trifle larger, is substituted in its place, and thus the calibre of the barrel is gradually enlarged to nearly the required size. Formerly, six borings were given to each barrel, but at the present time only four are permitted, aside from the rifling, which is a distinct operation, performed at the works on the hill, and will be described hereafter.

After the boring of the barrel, it is placed in a lathe, and the outside turned down to the proper size. The piece is supported in the lathe by means of mandrels inserted into the two ends, and there it slowly revolves, bringing all parts of its surface successively under the action of a tool fixed firmly in the right position for cutting the work to its proper form. The barrel has a slow progressive as well as a rotary motion during this process, and the tool advances or recedes very regularly and gradually, forming the proper taper from the breach to the muzzle, but the main work is performed by the rotation of the barrel. In the boring, it is the tool which revolves, the piece remaining at rest; but in the turning, the barrel must take its part in action, being required to revolve against the tool, while the tool itself remains fixed in its position in the rest.

A curious and interesting part of the operation of manufacturing muskets is the straightening of the barrel. This straightening takes place continually in every stage of the work, from the time the barrel first emerges from the chaotic mass produced by heating the scalp, until it reaches the assembling-room, where the various parts of the musket are put together. As you enter the boring and turning rooms, you are struck with surprise at observing hundreds of workmen standing with musket-barrels in their hands, one end held up to their eyes, and the other pointing to some one of the innumerable windows of the apartment. Watching them a few moments, however, you will observe that, after looking through the barrel for half a minute, and turning it around in their fingers, they lay it down upon a small anvil standing at their side, and strike upon it a gentle blow with a hammer, and then raise it again to the eye. This is the process of straightening.

The next process is that of grinding, for the purpose of removing the marks left upon the surface by the tool in turning, and of still further perfecting its form. For this operation immense grindstones, carried by machinery, are used, which rotate with great rapidity—usually, about four hundred times in a minute. These stones are covered with large, movable, wooden cases, to keep the water from flying about the room, or over the workmen.

An iron rod is inserted into the bore of the barrel and is fitted very closely. The rod is furnished with a handle, which is used by the workman for holding the barrel against the stone, and for turning it continually while he is grinding it, and thus bringing the action of the stone upon every part, and so finishing the work in a true cylindrical form. In the act of grinding, the workman inserts the barrel into a small hole in the case in front of the stone, and then presses it hard against the surface of the stone by means of an iron lever which is behind him, and which he moves by the pressure of his back. The work is very rapidly and smoothly done.

There are twelve sets of stones in the grinding room in constant operation day and night. These stones, when set up, are about eight feet in diameter, and are used to within twelve inches of the centre. They last about ten days.

In former times it was customary to grind bayonets as well as barrels; but the former are now milled instead, thus making an important saving in expense as well as gain in the health of the establishment. No mode, however, has yet been devised for dispensing with the operation of grinding the barrel; but the injury to the health, in this case, is much less than in the other.

When the barrels are nearly finished, they are proved by an actual test with powder and ball. To this purpose a building at the water-shops, called the proving-house, is specially devoted. It is very strongly built, being wholly constructed of timber in order to enable it to resist the force of the explosion within, and contains openings in the roof and at the eaves for the escape of the smoke, a very large number of barrels being proved at once.

About one per cent. of the barrels burst under this trial, although under the old process of welding there was a loss of nearly two per cent., or one in sixty.

There are forty-nine pieces used in making up a musket, which have to be formed and finished separately; only two of these, the sight and cone-seat, are permanently attached to any other part, so that the musket can, at any time, be separated into forty-seven parts, by simply turning screws and opening springs. Most of these parts are struck in dies, and then finished by milling and filing. The process of this manufacture is called swaging—the forming of irregular shapes in iron by means of dies, one of which is inserted in an anvil in a cavity made for the purpose, and the other placed above it, in a trip-hammer, or in a machine operated in a manner analogous to that of a pile-driver, called a drop. Cavities are cut in the faces of the dies, so that, when they are brought together with the end of a flat bar of iron, out of which the article is to be formed, inserted between them, the iron is made to assume the form of the cavities, by means of blows of the trip-hammer, or of the drop, upon the upper die. About one hundred and fifty operations upon the various pieces used in the construction of the musket are performed by these dies. Some of the pieces are struck out by one operation of the drop, while others, as the butt-plate, require as many as three, and others a still larger number. The hammer is first forged and then put twice through the drop. Four men are kept constantly at work forging hammers in the rough, while but two are required to put them through the two operations under the swaging-machine. Sometimes, however, the work presses upon the droppers, and they have the alternative either to work double time—that is, night and day—or to allow other hands to work with them; and as they work by the piece and are anxious to earn as much as possible each month, they will frequently work night and day for several consecutive days. I have known instances where workmen have worked from Monday until Thursday, night and day, without any intermission, excepting the hour and a half at the morning change of hands, one hour at noon, one at tea-time, and half an hour at midnight—four hours out of the twenty-four. By this means they will sometimes earn as much as one hundred and fifty dollars per month, although this would be an extraordinary case. The average pay in the dropping-department is about three dollars per day.

There are twenty-four simple and seven compound dropping-machines in constant operation. Some of the pieces are pressed into shape under these drops when cold—this being the case with the triggers, which were found to use up the dies too rapidly when they were swaged while heated; but, as a general rule, the swaging is done while the piece is at a red or white heat. The operations of the various dropping-machines are exceedingly interesting, and the amount of labor they save is perfectly marvellous.

A large number of men are kept constantly at work making dies for the various pieces required.

When the pieces come out of the swaging-machines, they have more or less of surplus metal about them, which is cut off or trimmed by passing them through machines designed for this purpose.

The bayonet blade is first forged under a trip hammer, and then rolled to the proper shape, by an operation similar to the barrel rolling. The socket is forged separately, and afterwards welded to the blade under a trip hammer. It is then passed twice under the drop, then milled and polished, when it is ready for use. The ramrod is cut from steel rods about the size required. It is then ground in the same manner as the barrel, and the hammer is swaged on by two operations under the drop. The screw cutting and polishing are very simple, and executed with great rapidity.

The cone-seating, like every other part of the work done upon the musket, is very interesting. The barrel, after it comes from the rolling mill, is placed in a forge and heated to a white heat. A small square block of iron, cut under a trip hammer to the proper size, is also heated to a white heat, and then welded to the barrel by half a dozen strokes under the trip hammer, the whole operation occupying less time than is required to describe it. An iron rod is meanwhile inserted within the barrel to maintain the continuity of the bore.

The sights are struck in dies, and placed upon the barrel in slots cut for the purpose. They are then brazed upon the barrel, pieces of brass wire, half an inch long, being used for this purpose. Three men are employed in brazing on the sights for the establishment.

The rolling, forging, and swaging rooms are all connected, and form, as it were, one extended apartment. In this are placed hundreds of forges, furnaces, trip hammers, rolling mills, dropping machines and trimming machines, besides scores of sledge hammers, wielded by stalwart arms. The noise here is so great that no effort of the voice avails to make itself heard, and I doubt if even the loudest thunder would make any appreciable addition to the general clangor. Small iron carts, filled with hot iron, are incessantly whirling around you; red hot sparks, or melting drops of iron, are flying about the room in all directions; the air is hot to suffocation, and sulphurous from the burning of bituminous coal; while hundreds of swarthy faces, begrimmed with grease and dirt, are dripping with sweat, so that you can scarce avoid the suspicion that you have at last stumbled into the infernal regions, and are constantly wondering why some of Pluto's imps do not seize you and plunge you into some horrible furnace, or chop you up under a trip hammer.

Having survived the examination of this department, you follow your guide from the forging room down a winding flight of iron steps to the water-wheels, which are situated forty feet under ground. These wheels are so arranged that they can be run together or separately; they are generally run together, and in connection with the immense low pressure engine.

After the barrels are bored, turned, milled and straightened, they are next to be polished. For this purpose they are placed in upright frames, each frame containing five barrels. The polishing is done by means of hard, wooden rubbers, provided with a plentiful supply of lard oil and emery. The rubbers are placed horizontally, with their grooved ends pressing by means of springs against the barrels, which are drawn between them by a very regular and rapid vertical motion The barrels are also turned around slowly and continuously by a lateral movement, which insures a uniform polish. They are allowed to remain in the first polishing machine fifteen minutes, and are then placed in a similar machine and go through a second polishing, differing from the first simply in the absence of the pulverized emery, oil only being used upon the rubbers during this finishing operation. The musket is now completed, with the exception of the rifling, and some slight polishing to be done by hand at the muzzle and breach.

Two polishing machines are used for ramrods, similar in construction to those above described—ten rods being polished at once. The bayonet is polished upon emery wheels. These wheels are made of wood bound with leather, upon which there is placed a sizing composed of glue and pulverized emery. The polishing by this process is very rapid.

I stated the number of pieces used in the construction of a musket to be forty-nine, but this conveys no idea of the number of separate operations which are performed upon it. The latter amount to over four hundred, no two of which are by the same hand.

The gun barrel, after it arrives at the works on the hill from the water shops, is taken to the old armory buildings to be rifled. For this purpose it is placed in a horizontal position in an iron frame, and held there very firmly. The instruments which perform the rifling are short steel cutters placed within three apertures, situated near the end of an iron tube, which is carried through the bore of the barrel by a slow rotary and progressive motion. The cutters are narrow bars of steel, having upon one side three diagonal protuberances of about one-sixteenth of an inch in height, and half an inch in width, ground to a very sharp edge at the top. It is these which produce the rifling. The three cutters, when inserted within the iron cylinder, form upon their inner surface a small cavity, which decreases towards the top. Into this is inserted a small iron rod, attached to the machine and revolving with it, but so controlled by a connecting cog wheel that the rod is pressed at every revolution a little farther into the cavity between the cutters. The effect of this operation is to increase the pressure of the cutters upon the inner surface of the barrel, and thus gradually deepen the corrugations produced by the rifling. The rods make twelve revolutions in a minute, and it occupies thirty minutes to rifle a barrel. There are twenty-seven of these rifling machines in constant operation day and night. This process is the last which takes place within the barrel, and it leaves the bore in a highly polished and brilliant condition.

Among the innumerable machines which arrest the attention of the visitor by the beauty and grace of their operations, is the broaching-machine. This is designed to cut out and polish the inner surface of the bands which encompass the barrel and stock. These bands are irregular in shape, and cannot, therefore, be bored out as the barrel is. When they emerge from the drop, or swaging-machine, they are somewhat rough both interiorly and exteriorly, and then undergo a series of operations which leave them in a higly finished condition. The first of these is called broaching. A cavity is made under a huge press in which the band is placed. The broach consists of a steel tool about ten inches in length, and of the exact diameter and form of the interior of the band, and is armed upon its entire length with concentric rings composed of very short and sharp knives. The broach, being placed over the cavity of the band, is slowly subjected to the pressure of the two-ten press, and is thus forced completely through the band, cutting it out as smoothly and easily as if it were composed of lead. The bands are then milled upon the outside by a process called profiling, drilled for the rings, placed upon mandrels to insure the exact shape required, filed, polished, case-hardened, and thus finished.

The hammer passes through a great number of processes before it is completed. It is first forged, then dropped, trimmed, punched, drifted, milled, turned, filed, and lastly case-hardened.

The cone, although one of the smallest pieces in the musket, is yet one of the most important, and requires a great many separate operations in its manufacture. It is first struck in a die, then clamp-milled,—passing through a machine having clamps which hold short knives that shave the entire outer surface of this very irregular shaped piece; then the thread is cut upon the screw, and both ends are drilled,— this process alone requiring fourteen separate operations. It is then squared at the base and case-hardened.

All the various portions of the lock are made by machines which perform their multitudinous operations with the most wonderful skill, precision, and grace; but it would be impossible to convey to the reader by a simple description upon paper the various processes by which these results are obtained.

Every portion of the musket is subjected to tests different in character, but equally strict and rigid in respect to the qualities which they are intended to prove. The bayonet is very carefully gauged and measured in every part, in order that it may prove of precisely the proper form and dimensions. A weight is hung to the point of it to try its temper, and it is sprung by the strength of the inspector, with the point set into a block of lead fastened to the floor, to prove its elasticity. If it is tempered too high, it breaks; and if too low, it bends. In either case it is condemned, and the workman through whose fault the failure has resulted, is charged with the loss.

The most interesting process, perhaps, in the manufacture of the musket is the operation of stocking. This is done in the old arsenal building, which, with the exception of one floor, is wholly devoted to this purpose.

The wood from which the stocks are made is the black walnut. This was formerly obtained in Pennsylvania, and was kept on hand in the storehouse in large quantities for the purpose of having it properly seasoned. During the last two years, however, Ohio and Canada have furnished the greater part.

The wood is sawn into a rough semblance of the musket-stock before it is sent to the armory. It then passes through seventeen different machines, emerging from the last perfectly formed and finished.

A gun-stock is, perhaps, as irregular a shape as the ingenuity of man could devise, and as well calculated to bid defiance to every attempt at applying machinery to the work of fashioning it. The difficulties, however, insurmountable as they would seem, have all been overcome, and every part of the stock is formed, and every perforation, groove, cavity, and socket is cut in it, by machines that do their work with such perfection as to awaken in all who witness the process a feeling of astonishment and delight.

The general principle on which this machinery operates may perhaps be made intelligible to the reader by description; but the great charm in these processes consists in the high perfection and finish of the machines, the smoothness, grace, and rapidity of their motions, and in the seemingly miraculous character of the performances which they execute.

The entire action of the various machines is regulated and guided by patterns, which are models in iron of the various parts of the stock which it is intended to form.

The first machine in the stocking-room cuts the sides of the stock to the proper form for turning. The second saws off the butt-end and cuts a diagonal line at the breech. The third is armed with two circular saws, which cut the upper part of the stock to the form of the finished arm. An iron pattern of the stock is placed in the machine directly under the stock to be turned, upon which rests a guide wheel, corresponding in size and shape to the two saws above. The whole is then made to revolve very rapidly, the guide-wheel controlling the action of the cutters, the result being an exact wooden counterpart of the iron pattern. The fourth machine forms the butt of the stock in the same manner. The next simply planes three or four places upon the sides of the stock, for the purpose of affording the subsequent machines certain fixed and accurate points for holding it in the frames. This operation is called spotting. The next machine performs six separate operations, namely: grooving for the barrel, breech-pin, and tang, heading-down, milling, and finish-grooving. These various operations complete the stock for the exact fitting-in of the barrel. The next machine planes the top, bottom and sides of the stock, and the succeeding two are occupied in shaping and bedding for the butt plates. The next machine is designed for fitting in the lock and is the most wonderful of all. It contains two bits and three cutters pendent from a movable steel frame situated above the stock. These cutters or borers are made to revolve with immense velocity, and are susceptible of various other motions at the pleasure of the workman. The inevitable iron pattern—the exact counterpart of the cavity which is designed to be made for the reception of the lock—is situated in close proximity to the stock, and a guide in the form of the borer is inserted within the pattern, and controls the movements of the borer. This is effected by causing the tool to revolve by means of small machinery within the frame, while the frame and all within it move together in the vertical and lateral motions. All that the workman has to do is to bring the guide down into the pattern and move it about the circumference and through the center of it, the cutting tool imitating precisely the motions of the guide, entering the wood and cutting its way in the most perfect manner and with incredible rapidity, forming an exact duplicate of the cavity in the pattern. It is on this principle, substantially, that all the machines of the stocking-shop are constructed—every process, of course, requiring its own peculiar mechanism. The next machine cuts for the guards and bores for the side screws of the lock, and the two succeeding cut places for bands and tips. The next operation is called the second turning, finishing the stock in a very smooth and elegant manner. The next machine grooves for the ramrod, and the following and last in this department is designed for boring for the ramrod from the point where the groove terminates. This latter work has always been done by hand until the past winter, and there is as yet but one machine for the purpose in operation at the armory, which, running night and day, is able to bore only six hundred stocks. The remainder have still to be done by hand, until more machines are constructed.

The history of the Springfield armory would be incomplete without some allusion to the inventor of the machinery for turning irregular forms adapted to the manufacture of gun-stocks. This was the invention of Thomas Blanchard, then a citizen of Springfield and now of Boston—whose reputation as a mechanic has since become world-wide—and was first introduced into the armory about the year 1820. Before this the stocks were all worked and fitted by hand; but the marvellous ingenuity of this machinery made a complete revolution in this department, and contributed to a very large increase in the rapidity and economy of gun making all over the world.

The same invention has been applied to other branches of manufacture, such as shoe-lasts, axe-helves, etc.; and Mr. Blanchard has successfully used it in multiplying copies of marble statuary with a degree of accuracy and beauty which is truly wonderful.

Eight years ago the English Government obtained permission of the then Secretary of War—Jefferson Davis—to make draughts of this entire establishment for the purpose of obtaining duplicate machinery for the works at Enfield, and copies of the most novel and important parts of the machinery were manufactured for them in the neighboring town of Chicopee; an American machinist being employed to superintend their operation at Enfield.

These works were the especial favorites of the late Prince Albert, who took great pleasure in exhibiting them to his Continental visitors; but no portion of the works received so much attention from him as that occupied by the stocking-machines. In this department he would frequently spend hours, watching the operations of these incomparable machines with the greatest interest and pleasure. As all of these ingenious and valuable machines are American inventions, and nearly all of them designed by the various expert artisans who have been employed at the armory during the last half century, it would seem proper and desirable that their peculiar construction should have remained a secret within our national works, and at any rate, not been freely given to a rival government like that of Great Britain, who might use the arms manufactured by American machinery against the very nation that furnished it. It is probable, however, that the arch-traitor, who thus furnished the governments of Europe with draughts of these valuable works, had then in contemplation the monstrous rebellion which now desolates our beautiful land, and took this means of weakening us by the universal dissemination of the valuable secrets whereby we were enabled to surpass the rest of the world in the rapidity of construction, and the beauty and executive power of our rifled musket.

When the several parts are finished, they are taken to an apartment in the arsenal to be put together. This operation is called assembling the musket. There are a large number of workmen whose occupations are confined to the putting together of the various parts of the musket—each one having some distinct part to attend to. Thus, one man puts the various parts of the lock together, while another screws the lock into the stock. Another is occupied in putting on the bayonet, and so on. Each workman has the parts upon which he is employed before him on his bench, arranged in compartments, in regular order, and puts them together with marvellous dexterity. The component parts of the musket are all made according to one exact pattern, and thus, when taken up at random, are sure to come properly together. There is no special fitting required in each individual case. Any barrel will fit any stock, and a screw designed for a particular plate or band will enter the proper hole in any plate or band of a hundred thousand. There are many advantages resulting from this exact conformity to an established pattern in the components of the musket, such as greater facility and economy in manufacturing them, and greater convenience in service—spare screws, locks, bands, springs, etc., being easily furnished in quantities, and sent to any part of the country where needed, so that, when any part of a soldier's gun becomes injured or broken, its place can be immediately supplied by a new piece, which is sure to fit as perfectly into the vacancy as the original occupant. Each soldier to whom a musket is served, is provided also with a little tool, which, though very simple in its construction, enables him to separate his gun into its forty-seven parts with the greatest facility.

The most costly of the various parts of the musket is the barrel, which, when completed, is estimated at three dollars. From this the parts descend gradually to a little wire called the ramrod-spring wire, the value of which is only one mill.

A complete percussion musket weighs within a small fraction of ten pounds.

Besides the finished muskets fabricated here, there are many parts of foreign arms duplicated at these works, for the use of our armies in the field—the most numerous of which are parts for the Enfield rifle, and for a German musket manufactured from machinery made after our patterns and models.

In the arsenal there is a case of foreign arms, containing specimens from nearly every nation in Europe. None among them, however, equal our own in style or finish, while all of them—excepting the Enfield rifle—are very inferior in every respect. The French arm comes next to the English in point of excellence, while the Austrian is the poorest of all.

There are three steam engines in operation at the works on the hill, one connected with the stocking department, and two with the other operations carried on here.

Twenty-five thousand dollars' worth of oil is used yearly in lubricating the machinery, and the various pieces of iron and steel, as they are being turned, bored, milled, broached, etc

At the water-shops there are five miles of leather belting in use, while at the works on the hill the quantity greatly exceeds this amount.

From the establishment of the armory to the present date, there have been manufactured 1,097,660 muskets, 250 rifles, 1,000 pistols, 1,202 carbines, 8,660 musketoons, 4,806 cadets' arms, 18 model muskets and 16 model pistols and rifles. The reader will be surprised, perhaps, to learn that there were 1,020 more muskets manufactured at these works during the year 1811 than in the year 1854. In 1850 and 1851, 113,406 muskets were altered in their locks, from flint to percussion, involving an amount of labor equal to the manufacture of 7,630 muskets. From 1809 to 1822, inclusive of those years and exclusive of 1811 and 1812, nearly 50,000 muskets were repaired—involving labor equal to the manufacture of 11,540 muskets.

In addition to the large number of muskets manufactured at the Government works in Springfield, and which amount to upwards of three hundred thousand per annum, there are a vast number of private establishments throughout the Northern States, which turn out from two to five thousand muskets per month each. These various manufactories are situated at Hartford, Norfolk, Windsor Locks, Norwich, Middletown, Meriden and Whitneyville, Ct., Providence, R. I., Manchester, N. H., Windsor, Vt., Trenton, N. J., Bridesburg, Pa., and New York city, Watertown and Ilion, N. Y. Besides these, there are more than fifty establishments where separate parts of the musket are manufactured in large quantities, and purchased by Government to supply the places of those injured or destroyed in the service. It is estimated that the private armories alone are manufacturing monthly upwards of sixty thousand rifled muskets. The Government contracts for these arms extend to January next, and the total number which will then have been produced will be enormous. The cost of manufacturing a musket at the Government works is estimated at about nine dollars; but the contract price to the private arms' companies is twenty dollars for those which equal the Government standard in every respect, nineteen dollars and ninety cents for those which lack a little in finish, nineteen dollars for the next grade, eighteen for the next, and sixteen for the lowest and poorest which are accepted.

As the arms are finished, they are sent away to the various Government arsenals—those made in New England to Watertown, Mass.—where they remain until the exigencies of the service require them. At the present time, there is a sufficient number of new rifled muskets of the best quality stored in the various arsenals to arm the entire levy about to be called into the field—and should the war continue so long, there will be enough manufactured during the next twelve months for a new levy of over one million of men. These arms, it must be remembered, are entirely independent of those ordered by the respective State governments, which would swell the amount very largely.

SUPER-HEATED STEAM.

Dr. Warren Rowell further explained the super-heater on the steamship Scotia, by which it is said there is a saving of seven per cent. The process is to mix the wet steam from the boiler with the dry steam in the super-heater, which is claimed as a great advantage. In regard to the utility of expansion as used on this ship, the steam following the piston two-thirds of the stroke, they effect an economy of only one per cent, when, according to theory, it should be twenty-five or thirty per cent.

Mr. J. Johnson.—The theory of Mr. Weatherhead is, that steam coming from the boiler has not the same elastic force, that it is too much saturated, and that super-heating makes it more elastic.

Mr. J. K. Fisher.—In Mr. Weatherhead's pamphlet, he argues an advantage in mixing wet with dry steam, as the dryer the steam is the less rapidly will it give off its heat to the metal with which it comes in contact.

Novelties at the Fair.

THE HOUSE BUTTON-HOLE MACHINE.

Mr. Seaman exhibited the House button and eyelet-hole sewing machine. He operated the machine and distributed the specimens among the members. It worked quietly, rapidly and easily. Mr. S. said it will make one hundred holes an hour, from one-eighth of an inch to one and a half inches in length; more firm, uniform and beautiful than handwork. It works, with silk or thread, any fabric from a single thickness of flannel to the stoutest cloth or other material. Two threads are used, and a gimp of any required size can be placed on the upper or lower edge of the hole. The fabric is held stationary, while the needles move around the edge of the hole, doubly covering it, and producing a broad or a narrow pearl, or an ornamental stitch with various colored thread.

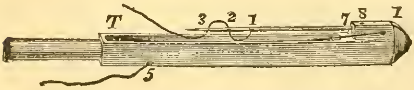
The following article, illustrated with cuts, will give a clear idea of the operation of this machine :

At the late fair of the American Institute held in the Academy of Music, the Wheeler & Wilson's Sewing Machine Manufacturing Company, exhibited the greatest novelty in this immense and still growing branch of American invention and industry—a machine for stitching button holes.

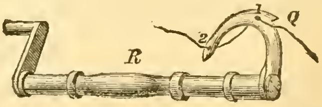
Its complete success, the rapidity and perfection of its operation, and the peculiar movement of the machinery in accomplishing its work, were all subjects of high encomium, and the committee on this class had no hesitation in awarding to its exhibitors the highest prize of the Institute, a gold medal.

We are only able to give a brief description of its mode of working. This at first sight seems complicated, but on investigation is found beautifully simple in its adaptation to the purpose designed.

The machine is the invention of two young men, brothers, James A. and Henry A. House. Their first attempt was to produce a stitch, novel in character, and throw or interlock the same over the edge of any fabric so as to cover it completely. This they succeeded in doing by using a straight and curved needle, the former penetrating the cloth from above at any required



The straight needle threaded, with its shank.



The curved needle threaded, with its shank.

distance from the edge, and the latter rising from below through the button hole. The straight needle has three eyes, the curved one two.

These needles work together, the curved being placed at such an angle as to give a loop to the straight in the downward motion of the latter, and to receive one as it ascends. This forms a double interlocking stitch, presenting, when the threads are loosely drawn, a double pearl as it is termed, or two rows of knots, as shown in fig. 1. The positions of these pearls upon the edge of the cloth are changed at will by varying the tension of the threads, and may be drawn together so as to present but one row of knots. (Fig. 2.)

Figure 1.

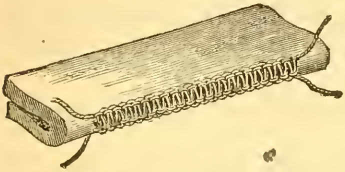
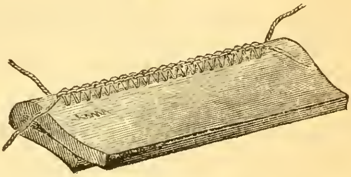


Figure 2.

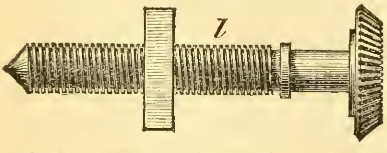


Although the stitch and mode of laying it were successfully perfected, the inventors now experienced the greatest difficulty in the way of final success. Many machines for stiching button holes had theretofore been attempted. Years and fortunes had been expended in inventions, but although several ingenious machines were produced, they were of no practical value, as all inventors seemed to start with the idea that, as in other sewing machines, the needle or needles must remain stationary, and the garment in which the hole was to be worked, moved around it. This effectually prevented complete success, as it was found impossible to turn the cloth with sufficient accuracy and rapidity to insure a straight-sewed edge and perfect eyelet at the end of the hole.

Aware of these failures, the Messrs. House determined, if possible, to reverse this motion and hold the cloth still while the needles moved around the edge of the button hole.

After several attempts they succeeded in producing the present machine, which was first patented on the 11th of November, 1862, and afterward became the property of the Wheeler & Wilson Sewing Machine Manufacturing Company.

The movements by which the result is obtained are beautifully exact. They consist of a screw and gripe-wheel, the former of which, attached by a nut to a bracket in the lower case, drives the stitching mechanism along the straight side or edge of the button hole, and the latter enclosed in a wheel turns the same around the eyelet or rounded end of the hole. (See figure I.)



The needles, threads, &c., are mounted on a travelling rotating disk, and both work from below through a slot or opening in a cloth plate. Upon this plate the garment in which button holes are to be stitched is fastened by a clamp, the needles projecting through a button hole.

In working the straight side of a hole, the screw carries the disk upon which the stitching mechanism is mounted at stated intervals along the edge, the gripe or lug from which a lever projects being disconnected and held still by a stop against which the lever strikes. When the straight side of the hole is worked, the lever or bar which holds the gripe slips off the stop, and the screw feed is disconnected or thrown out of mash. The gripe operated by an arm and eccentric fastened upon the main shaft immediately turns the disk around a half circle, so that the needles stitch around the eyelet. This done, another stop at the opposite end disconnects the gripe, the screw feed is again brought into operation, but with a reverse motion, and brings the needles down the opposite side of the hole to the place of beginning.

The interior of the machine is well shown in the diagram on opposite page, it being exact in all its parts. (See figure II.) Over this is placed an upper case, and when ready for work the machine presents this appearance. (See figure III.)

A bar or cord of any size required is laid automatically around the edge of the hole, the threads binding it firmly.

The size of the button hole to be worked is easily regulated by turning a screw at the end of the machine.

The time required to stitch around a button hole an inch in length is about twelve seconds, and an operator with the assistance of two girls to prepare and bar the ends, will easily finish one thousand holes per day, all exactly alike.

The stitch, which is novel in character, can be applied to the making up of all materials where two edges are to be sewed together.

In conclusion, attention is asked to the following comments from Appleton's American Annual Cyclopædia :

An important improvement in sewing machines was patented November 11, 1862, by J. A. & H. A. House, which is now the property of the Wheeler & Wilson Sewing Machine Co. It is designed specially for the working of button and eyelet holes, although the range of the invention easily adapts the peculiar stitch claimed to various other purposes; in fact, it may be fairly said to supply the link which was needed to make the chain of automatic movements in all classes of sewing, complete.

For many years it has been the constant study of inventors to produce a machine which would throw a stitch over the edge of any fabric so as to cover or bind it. The great sewing machine companies of this country had expended many thousands of dollars in vain attempts to realize what was finally voted almost an impossibility, though acknowledged to be a necessity.

There had previously been several partially successful machines designed for this purpose, invented and patented, but as the inventors appeared to entertain the idea that the fabric must be moved under or around stationary needles, the machines, though ingenious, were of no practical value, it being found impossible to form a perfect eyelet or rounded end of the button hole.

The idea of holding the fabric stationary and moving the needles around it, at the same time throwing what may be termed a double loop interlacing stitch over the edge of the whole finally occurred to the Messrs. House, and they, after several attempts, succeeded in producing the machine mentioned.

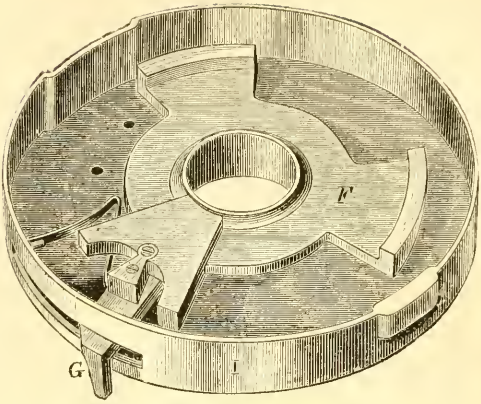


Figure I.

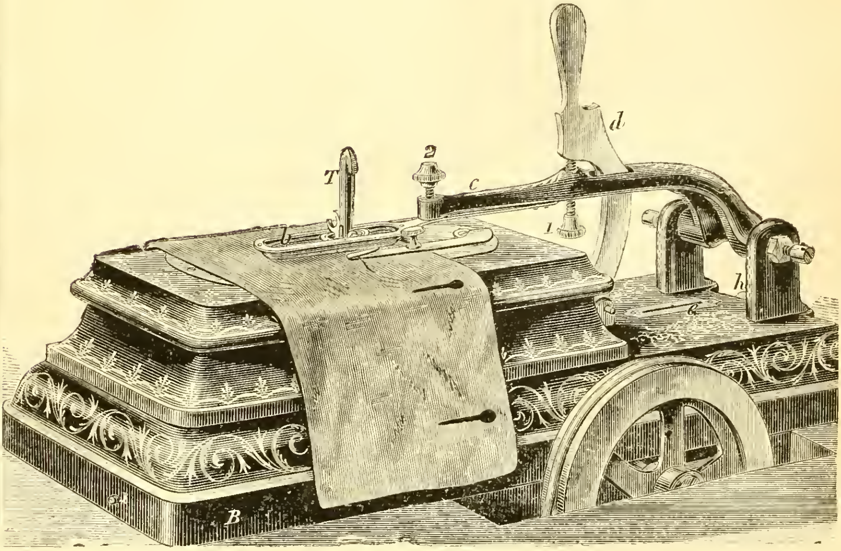
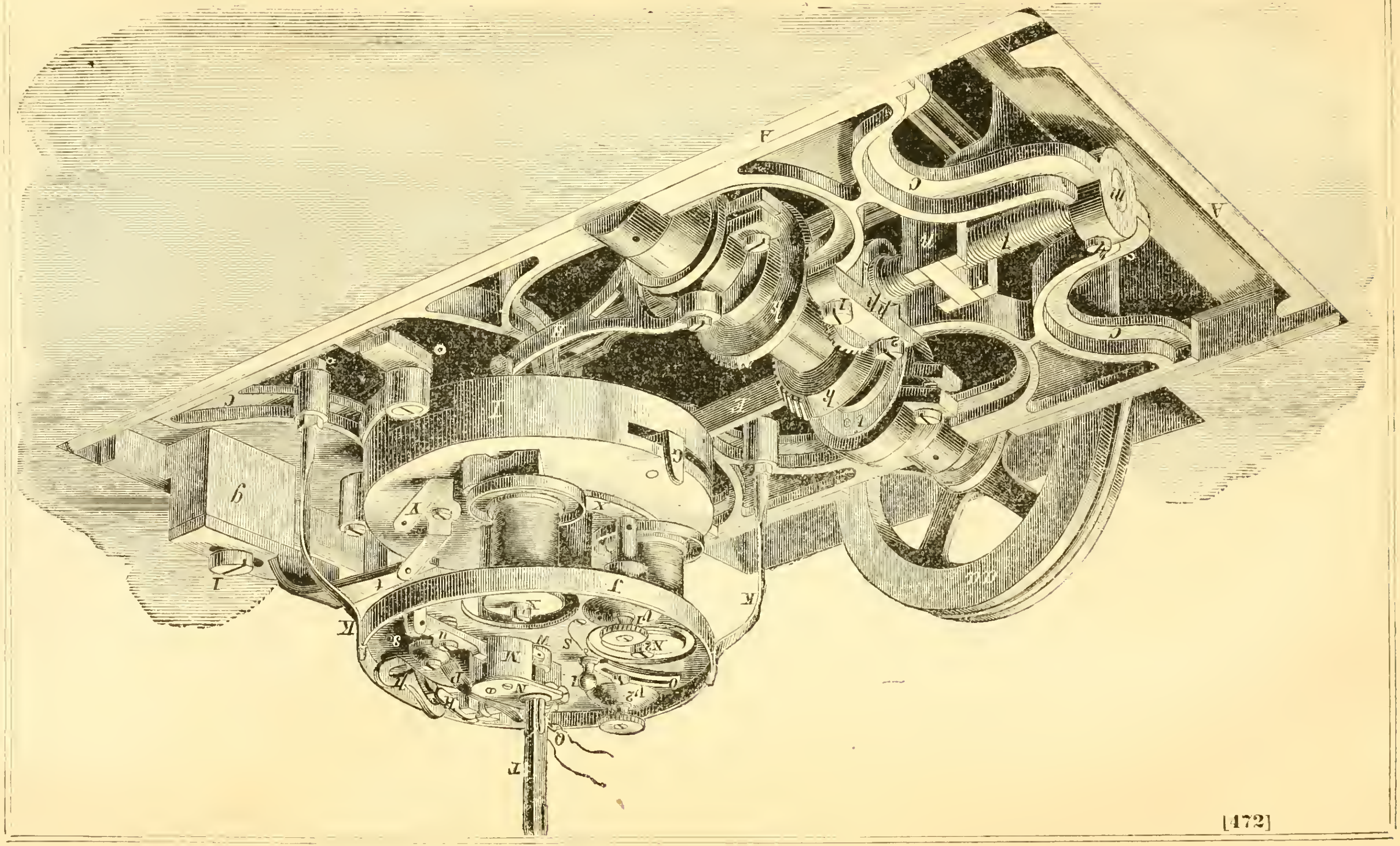


Figure III.



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The motive power of machinery to move the needles, one of which is straight and pierced with three eyes at the point, while the other is curved and has two eyes, is entirely below the bed plate. The straight needle is attached to an arm or shank which projects through a slot above the bed plate, and this is fastened to a mandrel working from below; underneath the bed plate is a disk upon which are placed the spools, tensions, &c., and working through which, in a slot, is the curved needle or finger, so called.

The cloth or garment in which the button hole or eyelet hole is to be worked, being punched, is placed upon the bed plate, the hole being directly over the slot, and the end of the needle shank projecting through it. The cloth is then pressed down upon the plate by what is called a foot or lever, and securely confined. On turning the crank the needle shank rises, and then, in its downward motion, carries the straight needle directly through the edge of the fabric. The curved needle or finger which works through the hole brings its thread up over the edge of the cloth. This thread is caught by the straight needle in its downward course, then the finger draws it down below the fabric and takes a loop from the straight needle, and ascending gives a loop again to the straight needle, thus forming a double interlacing stitch.

The disk, which is the most important portion of the machine, is mounted on a travelling carriage moved backward and forward by a screw.

When the operator starts the machine, the needles being at the lower end of the button hole are moved along the edge or straight side by the screw feed; on reaching the end the screw feed is disconnected from the disk by a switch, and a gripe or rotating movement carries the needle around the end of the hole, forming a perfect crescent; so soon as this half circle is complete the switch again pushes the screw into position, and this by a reverse motion drives the needles down the other side of the hole to the point of departure, forming a complete button hole.

The size of the button hole is readily regulated by an index attached to the machine, and it will work a hole two inches in length, or an eyelet of less than an eighth.

An ordinarily skilful operator will, with the assistance of two girls to finish or tie the ends, work one thousand fine button holes an inch and a quarter in length in ten hours, and all exactly alike. By the hand not more than forty can be made by the most accomplished operator in the same time.

As stated, the range of this stitch is not confined to button hole making, but includes the sewing of sails, tents, awnings, indeed all classes of work requiring two straight or selvage edges to be bound securely and smoothly together.

Improved Kettle for Boiling Water.

Mr. Seaman also exhibited an improved kettle for boiling water. It was made with a hollow bottom separated some two inches from the ordinary bottom of a kettle, and held to it by three or four small tubes through which the water circulates. This arrangement gives three times the heating surface of an ordinary kettle. Mr. Seaman said he had boiled seven quarts of water in less than seven minutes. The circulation upward through the tubes connecting the two bottoms was so great that a handfull of sand was thrown up through them when the water commenced to boil. The extra expense of these kettles is only thirty cents.

The Chairman.—Water is heated by convection, and not by conduction. We can have ice at the bottom of a boiler, and water can be made to boil at the top, if the heat is applied at the top. When heat is applied at the bottom, the rarified water and steam rise to the top, displacing the cold water, which descends; thus the heating of water is effected by its circulation.

New Link Motion.

Mr. W. R. Greenleaf, of Silver Creek, N. Y., exhibited a model of his new mode of producing link motion for steam engines. Upon a shaft a sleeve is fixed, upon which movable eccentrics are placed, and so arranged that when the engine is running the cut off can be put in any desired position. The ordinary link sometimes slips a quarter of an inch, and this has a very bad effect. In this invention, when it is once shifted, it will remain so. Another improvement in the model was a conical valve, with three narrow ports. The trouble with conical valves has been that they expand before the other parts, but in this plan the heat is on the outside, which prevents the valve from sticking. The motion of this valve is such that it will travel much faster at the end of the stroke than in the middle. The advantages which are claimed for this valve, are that it is a balanced valve, very simple in construction, and it gives a more perfect movement, is not liable to get out of order, and is specially adapted for locomotives.

After examining the various models presented during the evening, the Association adjourned.

"Novelties at the Fair," was continued for the next discussion.

Adjourned.

American Institute Polytechnic Association,
October 15, 1863.

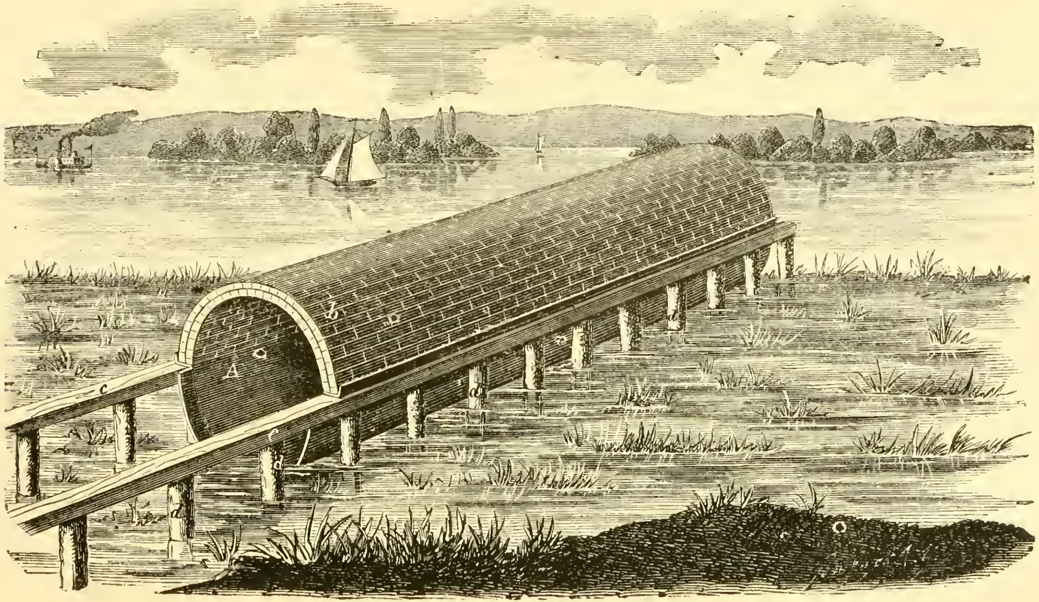
Chairman, S. D. Tillman, Esq.; Secretary, Mr. John W. Chambers.

Novelties at the Fair.

IMPROVED SUSPENSION CULVERT.

Mr. Charles McIntire presented for examination his plan, herein described, of the improved suspension culvert. Sewerage near cities and towns has always been a subject of great perplexity, on account of the expense and trouble of procuring a foundation. This has been the difficulty, especially when the culvert (or sewer) was required to be constructed through swamps, quicksands, and where it is necessary to be extended out into the river.

The accompanying engraving represents the improved suspension culvert (or sewer) which will obviate this difficulty by dispensing with the coffer dams, cradling, and the trouble of using pumps, so necessary sometimes in the old method for obtaining a foundation. The plan is so plainly shown in the engraving that a description is hardly required. A represents the lower arch of iron, with the flanges at its upper edges resting upon the stringers c, supported by the piles d d. The masonry arch b rests upon the flanges of the iron arch A.



Improved Suspension Culvert.

The question of the best system of sewerage for cities and towns is very urgent, and at no period has it ever been of greater importance than at the present time. The healthy existence of cities and towns must ever be influenced by their sanitary condition.

Diseases are natural to man when thickly congregated, whether in cities, towns or armies, but their ravages are greatly aggravated by the physical impurities of the atmosphere.

It is impossible, unless at great expense, to construct a culvert (or sewer) on the old method, through quicksands and springs, so as to prevent the water from working through the lower arch and thereby washing the sand through the joints into the sewer from behind the brickwork, causing the brick to press out and undermine the upper arch when there is an internal pressure from a great flow of sewerage, thereby causing frequent repairs, or facilitates their acting like sieves by allowing the filth to percolate between the cracks, leaving the solid parts of the sewerage-matter to settle, deposit and become a nuisance for want of sufficient water to carry it off in suspension. The ground around the sewer becomes filthy, which causes the offensive odor and poisonous gases to arise, so frequently complained of in cities, from the long retention of matter putrifying in and around the sewers.

The advantages of the improved suspension culvert (or sewer) may be stated as follows:

1st. The iron counter will obviate all the difficulties in constructing sewers through swamps, quicksand, springs &c., and it will prevent any of the liquid within from percolating the street, and with the smoothest possible surface for the passage of the water, will keep the sewerage matter in suspension until carried off by the ordinary flow of water.

2d. It is simple in its construction. While it is durable, less expensive, and can be built with more correctness and regularity, the accuracy of the form and the exactness with which it can be laid to a true inclination is of a great practical importance, by keeping the flow in motion and preventing the sewerage-matter from settling.

3d. The expense and trouble of putting in the cradling, coffer dams, &c., and the dangers that are connected with the breaking of these, are avoided.

4th. The filth and dirt which are often gathered in those places through which culverts are required to be built, can remain and need not be disturbed in order to put in the suspension arch.

5th. The filling-in can be carried on while the workmen are putting the bottom counter to its place, and the water can pass through it while the masons are building the top arch.

6th. The stringers and flanges can be used as a railway to convey the materials to the workmen.

7th. It can be constructed with perfect safety at any season of the year, and only a portion of the piles necessary in the old method are required.

8th The culverts can be carried out to the ends of piers, so that the filth will be emptied into the current and carried away, by which arrangement the docks will be kept clear, and all causes of disease arising from malaria in such places will be avoided.

9th. When laid in quicksands the top arch can be cast of iron and bolted together so as to break joints with the lower counter, thus forming one of the strongest and most substantial structures that possibly can be put in such places; the quicksands cannot work through and undermine, and thus cause it to settle.

10th. It is adapted to low, flat districts. It can be laid with greater accuracy, with less inclination, and having a smoother surface, which will greatly add and facilitate the hydraulic flow to carry off the sewerage.

11th. It will drain the subsoil effectually; the water is permitted to enter and drain through at the flanges above the ordinary level of the sewerage, at the same time not permitting the sewerage to escape, thereby aiding to carry it off while in suspension. Thus preventing the offensive odors and poisonous gas, by the retention of putrefying matter collected in bad constructed sewers, so often complained of.

12th. When compared with the present mode of building culverts or sewers, it combines the two great requisites universally desired, viz.: cheapness and durability.

An improvement that possesses so many advantages must commend itself to the public. By its use, much property that now lies waste and useless near cities and towns, on account of the difficulty of drainage, can be reclaimed and made valuable. In many places, much sickness that is caused by malaria, arising from stagnant pools and swamps, would be avoided were the drainage less difficult, which is now remedied by this invention. Its simplicity, efficiency, durability and economy will recommend it, and when once seen will meet with general favor and use. The plan and design have been inspected by several experienced culvert builders, and pronounced by them a great improvement.

Hose Coupling.

Mr. Thomas H. Braisted presented a new hose coupling which differs from the ordinary coupling in not having any screw threads on the ends which fit together, but the ends are plain and slide into each other. The inner piece having a tapering groove around it, and on one side of the outside piece is fitted a small screw with a tapering point, and when the two ends are brought together this screw is turned, which passes into the groove in the inner piece and thus binds both ends tightly together. Mr. Braisted said the advantages of this coupling are—that it is perfectly water tight, and can be used with ease and rapidity, being very easy to connect and disconnect. It promises to be of great benefit to the public as a large amount of property is frequently destroyed for the want of means for a quick application of water at the commencement of a fire. This coupling was used by the engine that received the premium at the crystal palace fair in London.

Conformater.

Mr. Samuel Clark presented his improved conformater for measuring the shape of the head and used by hatters. He said heretofore this apparatus for measuring the head has been made in France, and this is the first of the kind made in this country. There can be no doubt of their utility as every man who wears a hat well knows. After a hat is made and ironed in a certain shape, it will always remain in that shape, and no amount of wearing will change it. The injurious effects of wearing a hat not made to the shape of the head, can readily be perceived, as the whole weight of it rests upon three or four points of the head and stops the circulation of the blood, thus giving rise to headaches, or an uncomfortable feeling generally. By taking the shape of the head with this instrument, a hat can be made to fit exactly the various outlines of the skull and giving perfect ease and comfort to the wearer. The French conformater is used by pressing it down upon the head when the various levers or pins adapted themselves to its shape. This mode is disagreeable, as at times the violence with which it is forced down upon the head gives considerable pain. In this instrument the process is very different. The levers are first drawn back and the machine placed on the head, and when in the proper position by turning a handle, the levers or pins are all let loose and fit themselves to the shape of the head; they are then locked up in that form and the hat is ironed according to that shape. The French machine being made of ebony, which is a cross-grained wood, the levers warp and swell and the glue does not hold to it long; but I make my levers of mahogany to which the glue holds as strong as the wood itself. The French ebony levers have to be made large and clumsy to have the requisite strength, but as I use mahogany, the levers can be made much smaller and therefore a greater number can be put on, giving a more accurate measurement. The price of the machine here exhibited is $50.

Dr. Rich.—Any one who has had the French machine used on his head will readily see the improvement in this. I have had my head sore for a week from the violence used in pressing the French instrument down on my head.

A NEW WRENCH.

Mr. Clark also exhibited a very ingenious instrument for screwing up bolts and nuts when in situations not accessible to the ordinary wrench. It was made in the shape of the letter L, and by turning a small crank at one end a circular wrench was made to turn at the other. It might be called a wrench to act around a corner.

A NEW HAY PRESS.

Mr. Dederick presented a model of his parallel lever press. He said the screw was the first power used in packing hay, and nothing can be said against it but its slowness. To obviate this the toggle joints is used, which saves some three-fourths of the time in packing a bale of hay. My improvement embraces two levers, as shown in the model here, by which as much power can be obtained as with the screw, and the machine can press eight bales of hay an hour. Probably one half of the hay that comes down the Hudson river is pressed by the toggle joint machine. With hoop iron bands the hay is held best, but it is the most expensive. It is customary to charge one dollar a ton for pressing hay, the owner of the hay furnishing the hoops, bands, &c.

Mr. Benjamin Garvey.—Several interesting inventions and improvements have been presented to us this evening, and what renders them doubly so is that they are entirely American. In the hay press of Mr. Dederick, we have a very useful application of the lever principle, but there is one feature in it that requires an improvement and that is that the parallel levers can only go a certain distance, and should the hay be thrown loosely into the box, these levers might exert hardly any pressure upon it, and therefore it requires considerable care and judgment in packing the box to a certain height so that the bales may be pressed with uniformity.

MACHINES FOR MAKING COVERED CORD.

This machine, invented by John Turner and J. E. Palmer, of Montville, Conn., was exhibited at the Fair by Mr. Turner, who gave the following written description of it: This is the first machine invented that successfully performs the work intended. It takes the yarn for the body of the strand, and the yarn for covering the outside of the strand, and in one process, makes them into the complete cord, which is used for hanging pictures, mirrors, &c. The large and increasing demand for this style of cord, renders this an important invention. To the casual observer, the apparatus has the appearance of a very simple, ordinary cord machine, constructed on "the Sun and Planet" principle, and such it essentially is. The arrangement for covering the strands of the cord before laying, consists in placing separate platforms containing the bobbins of covered thread directly above and running on the same axis with the bobbin platforms containing the threads which form the body of the strand; yet they have an independent motion, and run at a much greater speed. In consequence of this the covered threads are wound directly around the partially twisted threads, composing the centre or body of the strands, as they emerge from the top of the hollow spindles forming the axis on which the bobbin platforms revolve. The bobbin platforms, containing both the body and the covering threads, derive their motion from pullies attached to the under side of them, and running in contact with rings having a flat inner surface within, in which they revolve, the centrifugal force when running being sufficient to give the necessary friction. After receiving the covering described, the several strands are brought together and laid into a cord in the usual way.

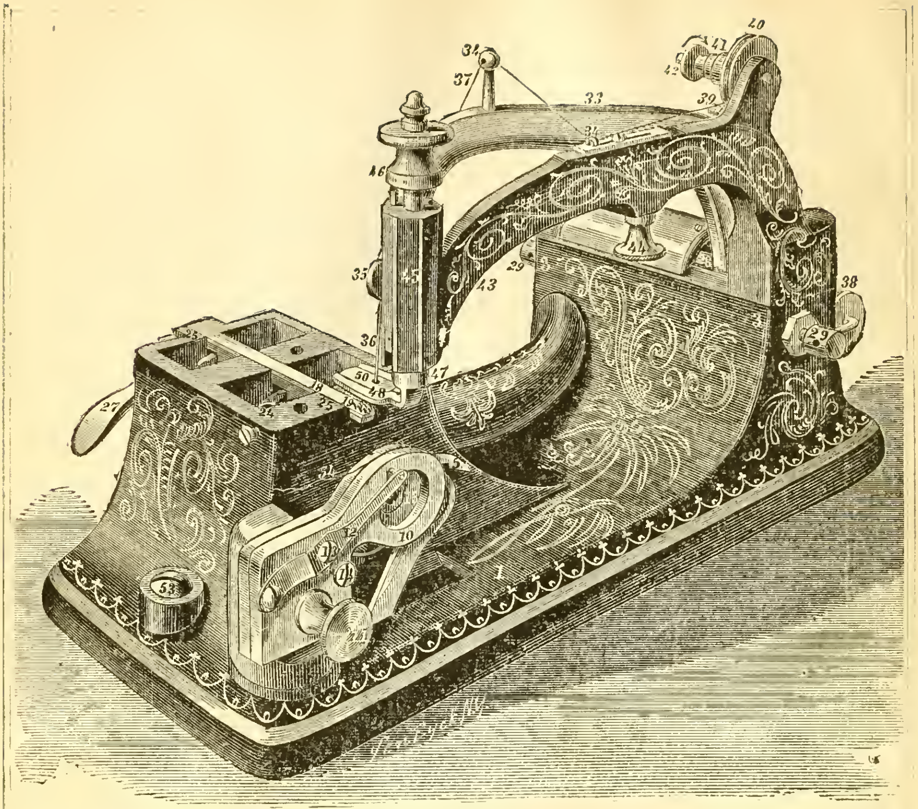
The merits of the machine may be thus briefly enumerated. It is extremely simple in construction. It occupies but small space, requires but little power to operate it, and is easily tended. It makes cord in one continuous piece, of any desired length, thus saving the waste arising from cutting up the usual short lengths of hand made cord. It puts just enough and no more covering than is necessary on the strands, and with a uniformity which it is impossible to attain by hand. Its chief merit is that it saves at least nine-tenths of the cost of labor by the usual hand process.

The subject selected for the next discussion was "Iron plating for vessels of war." Adjourned.

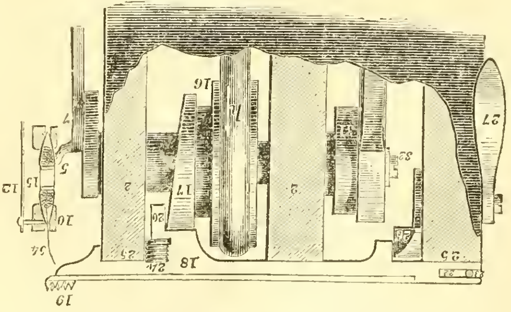
AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
THURSDAY EVENING, *October* 22, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. J. W. Chambers.

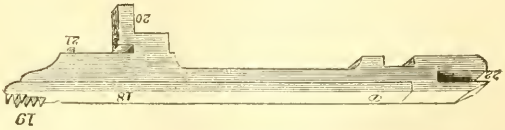
The Chairman having invited, by letter, Rear Admiral Lessoffsky of the Russian Fleet, to hear the discussion on Iron-clad vessels this evening, received the following reply which was read by the secretary.



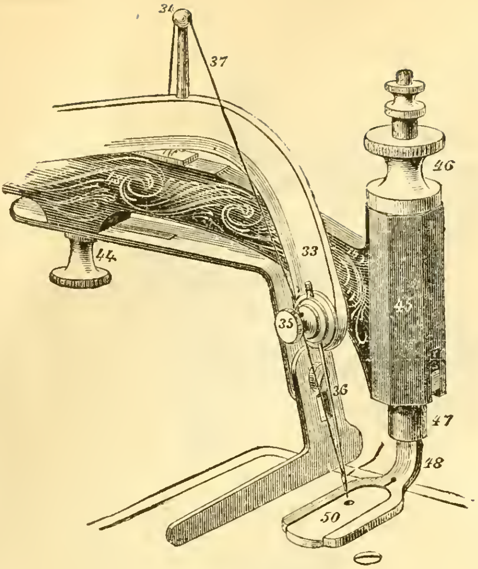
Machine with the cloth plate removed.



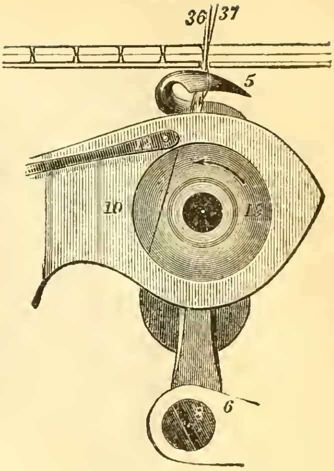
Front sectional view of the mechanism.



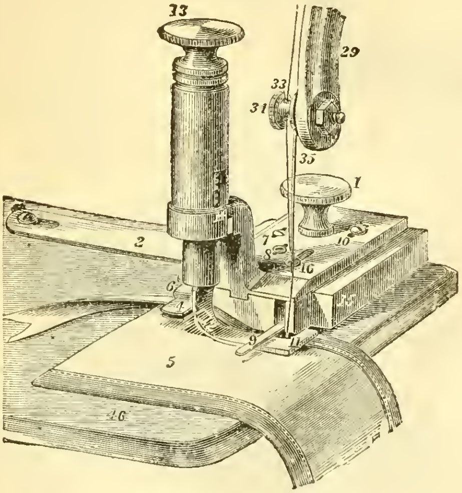
The feeder.



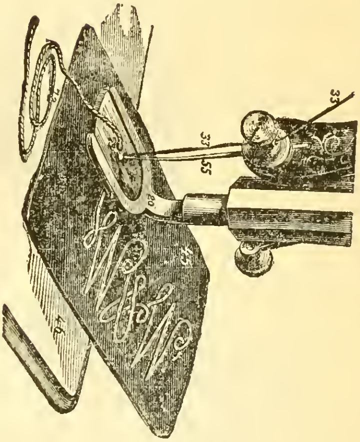
Large Guide.



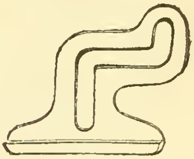
Needle and Hook.



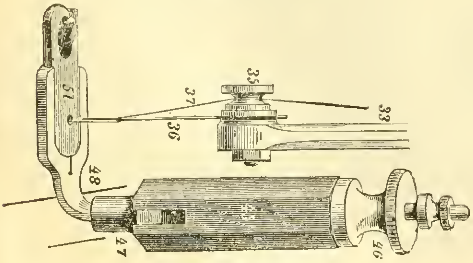
The Adjustible Binder.



The Braider.

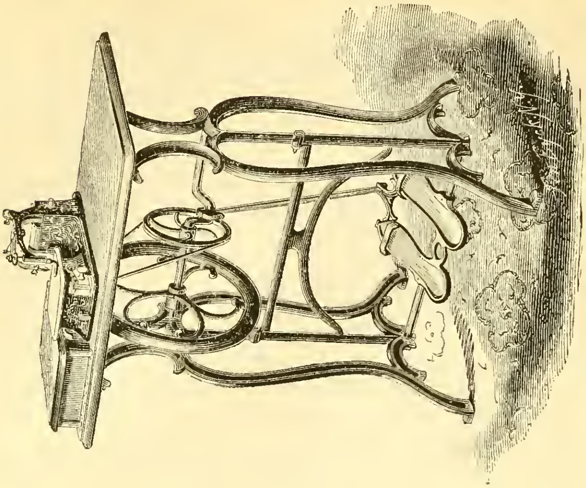


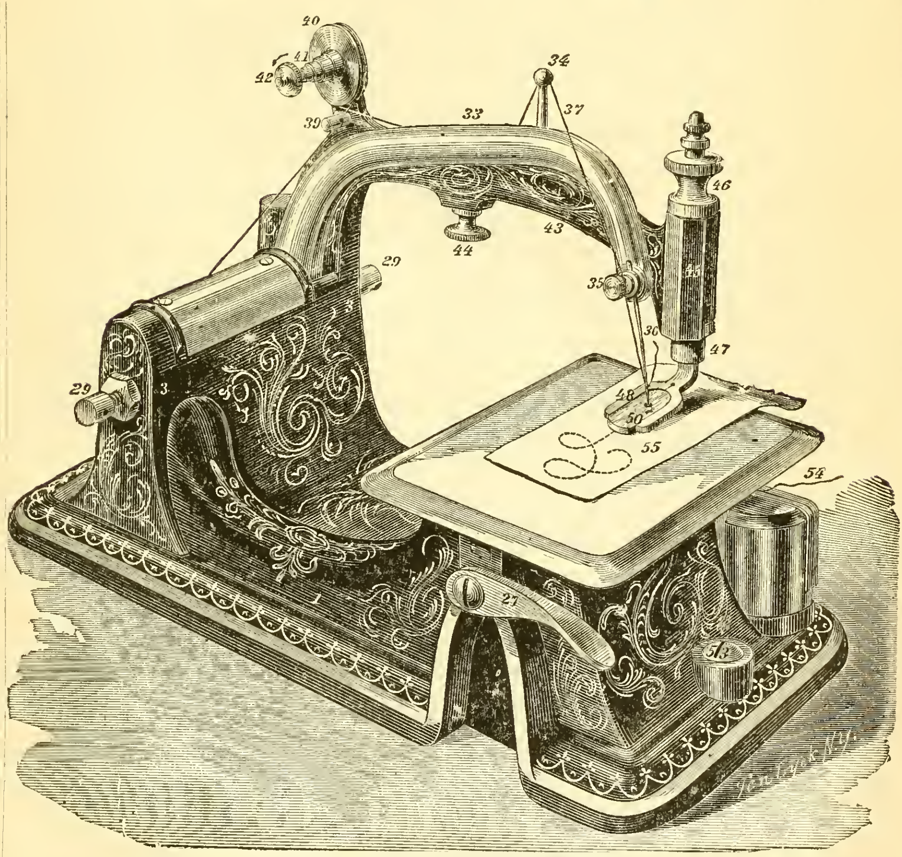
Small Guide.



The Hemmer.

THE ELLIPTIC SEWING MACHINE---The Machine on the Table.





Enlarged view of the whole Machine.

Samuel D. Tillman, Esq.:

Sir—I beg to express my gratitude for your invitation to attend the next meeting of your Association on Thursday the 22d. Unfortunately I find it impossible to comply with it, as according to a previous engagement, I am to start with the greatest part of my officers on an excursion to Niagara Falls.

I feel a deep regret at missing the opportunity you kindly offer me, to acquire valuable information on a subject so important in the present warfare.

Not being able to join you, I expect you will kindly extend your enlightened welcome to Captain Bootakoff of the Oslaba, the senior captain of the Squadron, and to such of our officers whom duty will permit to accompany him.

With great respect, yours,
S. LESSOFFSKY.
Rear Admiral, Imperial Russian Navy.

Flagship Alexander Neosky, the 9 | 21st of October, 1863.

Capt. Bootakoff and several other officers from the Russian Fleet, here entered the room and after a cordial welcome from the Chairman were conducted to seats reserved for them.

The Elliptic Sewing Machine.

The miscellaneous business commenced with the exhibition of this machine from A. H. Suplee, 537 Broadway. Miss L. O'Connell operated the machine, and explained very clearly its several parts. The principal improvements in this invention are the elliptic hook and stationary bobbin-holder, made by Mr. Blodgett, of Philadelphia. By aid of the annexed illustrations and description, the working of the machine, which uses two threads, will be readily understood. Figure 1 is a view of the machine on the table. Fig. 2 is an enlarged view of the machine removed from the table. Fig. 3 shows it with cloth-plate removed. The spool of thread is placed in the spindle 38; the end is passed under the drag-bar 39, which has in it a spring for the purpose of holding the thread firmly as it passes around the tension pulley 40, thence through eyelets 34, 34-35, and through a needle-eye from left to right. The under thread is wound on the metallic bobbin 15, by the spindle V, under the point of the table. When filled, the bobbin is placed in the bobbin-holder 10, by slightly unscrewing the large nut 11. Particular attention is called to the simple and ingenious device of the hook 5 and the bobbin-holder 10. This bobbin-holder being stationary, the drag or strain on the under thread is entirely avoided, thereby requiring only one-half the tension necessary in all other machines. The advantage gained is elasticity of stitch. The screw 14 is for the purpose of pushing the holder slightly apart, to give the heaviest flax thread room to pass freely around the bobbin without the slightest wear. The spring 12-13 is used to produce the tension on the bobbin-thread, and is only employed when linen thread is used. This adapts the machine to a great range of work. Fig. 4 is a front sectional view of the entire mechanism: 5 being the elliptic hook; 18-19, the feed-bar; H, the leather band in a grooved pulley, communicating with the treadles. The cam 17 gives motion to the feed-bar, which alternately raises and throws forward the feed, when it is moved downwards and back by the spring 24. The length of the stitch is graduated by the stitch-lever 27 acting on cone 26; this also regulates the machine for "gathering," by raising the lever as high as possible—no other alteration being required for that work. Fig. 5 is a view of the feed-bar removed from the machine. In case of the feed being worn on the bearing 20, the screw 21 will raise the top plate 18 to its original height. Fig. 6 shows the operation of the needle 36 and the elliptic hook 5. The hook is seen passing above the eye of the needle and carrying the loop around the bobbin. The hook, by its elliptic motion, leaves the loop beyond the centre of the bobbin, when it is drawn into the fabric by the hook in taking the next loop. This hook forms the stitch without twisting or untwisting the thread, and consequently with the least friction. Figs. 7 and 8 represent the large and small guides; the large guide is fastened by the screw 44. When used for quilting, the screw 36 is loosened, and the lower part of the guide raised to admit the quilt, in passing under, to be guided by last row of stitching. Fig. 9 is the improved hemmer, substituted in the presser 48; it is also used for felling and turning edges of every description. Fig. 10 is the braider. The braid is passed through hole 73, when it is stitched as in ordinary sewing with the aid of the operator. Fig. 11 is the adjustable binder. Nos. 9, 6, 4 are guides for the edge of the binding 3, which are adjusted by 10, 6, 7. It is adapted to binding of various widths, by moving 15 backward or forward, which is held by the screw 16. More or less binding can be thrown on the upper or lower side by adjusting the guides properly.

THE COPPER MINES OF CANADA.

Dr. R. P. Stevens: In prosecuting the geological survey in Canada East—comprising parts of the counties of Sutton, Rome, Bolton, Ascot and Shiptown—mines of copper were discovered, specimens of which are here presented. They cover an area of from three to five miles. The copper lays in two great valleys. The ore is mostly found in limestone, so that immense excavations have been made in the limestone—some, much larger than this room. One mine of this rock has already realized from one million to a million and a half of dollars. There are probably in Canada, now being developed with promise of success, more than fifty copper mines. If only half of them should be successful, they would be worth more than all the other interests of Canada—not excluding the great fur trade of the West. Another position in which this mineral is found is in the immense slate rocks which abound in this locality. The Dr. here explained in detail the different specimens of copper ore on the table.

HUMAN STRENGTH.

Dr. John B. Rich read the following extract:

Dr. George Winship, the strong man of Boston, now raises daily the extraordinary weight of twenty-six hundred pounds. His operating rooms under the old Park street church, Boston, are daily thronged with the curious as well as those who are desirous of learning the art of how to be strong. In one corner of the room stands his famous lifting machine. This consists of a solid framework of wood about seven feet in height, with a platform about half way up upon which the Doctor stands to go through his daily exercise. A shoulder bar and a quantity of leather straps and bands form the harness with which the feat is performed. Under the platform the weights are suspended. These are composed of broad iron plates of a circular form, resting one upon the other, and held together by means of a stout iron rod running through the centre of each. Surrounding these plates are long, slim bars of iron running transversely, and made to be detached or joined to the main body. They are arranged in this manner so as to graduate the weight—one being added as often as is required by the increasing strength of the practitioner. They are each of twenty-five pounds weight. The whole body of iron suspended in this manner, and which is raised daily by Dr. Winship, is 2,600 pounds. Dr. Winship thinks he shall continue his experiment until he can raise 3,000 pounds. This, he believes, is the practical limit for one of his organization and constitution; but he is of opinion that men superior to him in these last mentioned points may be trained to raise far greater weights.

In another corner of the room a small horseshoe magnet, suspended by a cord, attracts the attention of all visitors. Curiosity centres upon this trifle from the following circumstances: Dr. Winship began his experiments by suspending an ordinary horseshoe magnet and adding a little weight every day to the small piece of iron attached to the poles. The sustaining power increases in precise ratio to the weight added. At first it would sustain twelve ounces—more than this would cause the iron to detach. In twenty-four hours another ounce was added and sustained, and this experiment was repeated daily until the magnet now sustains nearly eleven pounds, the attracting power increasing much more rapidly than at first. It was this magnet which first gave Dr. Winship the idea of increasing his own strength by gradual development. He began adding little by little to the weights raised, and raised the amount daily until he has practically and in a wonderful manner demonstrated the truth of his theory. An extensive practice now rewards him for the time and trouble consumed in his researches in this direction.

The manner in which this feat is performed, said Dr. Rich, has not the merit of novelty, as even greater weights have been raised by similar means. It is done by applying the principle of the toggle joint. The weights are placed beneath the platform with two handles coming through with shoulder straps attached, between which the operator places himself, and by bending the knees outward a little the body is lowered; the weights are then taken hold of when the knees are gradually brought inward to a straight line, which slowly raises the weights. It is said that Dr. Winship, by practicing this system, has become a very strong man from a weak one. As far as he is concerned, it may be so; but there is nothing advantageous gained by developing a particular set of muscles, or by the cultivation of one faculty alone. In order to insure health it is essential that all parts of the body should be properly and harmoniously developed; but in order to do this it is not necessary for a man to become a second Sampson by cultivating certain muscular powers to the exclusion of others which should be exercised in every individual.

Our Intercourse with Russia.

The Chairman.—We are about to exhibit an improvement in stoves by Delano, and the subject reminds me that we have a confession to make, and very properly, in the presence of our Russian friends. The Americans claim to be in advance of Europe in all departments of mechanism, but there is one article they have not succeeded in manufacturing. In this, however, they are not singular, for to England, France, Germany, and indeed to all nations except one, the method is still a mystery. I allude to Russia sheet iron, made only in the mines of Siberia; and the process which has so long puzzled the technologists of the world might appropriately be called *The Russian Riddle.* The importance of this material to this country may be appreciated when we take into consideration the almost universal use of stoves in the northern states; parts of the best stoves, and the pipes attached, being made of this polished sheet iron. We must acknowledge, therefore, that a large portion of the heat force, which cheers and animates us during the coldest weather, is radiated from a Russian metal for which this country has already paid many millions of dollars.

There is another interesting subject to which I may now allude, because it affects Russia and the United States alike—although it is of great importance to every civilized community. I refer to the Pacific telegraph, which is to unite the new world with the old.

In 1859, when the public expectation was highest with regard to the telegraph by the Atlantic route, I felt constrained to express, before this Association, some objections to its feasibility, and at the same time to present a plan for reaching Europe by extending a telegraphic line across this continent to San Francisco, from thence north to Bhering's Straits. As the currents of the Pacific are always northward through these straits, there would be no danger to the wire crossing it from icebergs. It was remarked that to carry the wire across Asia, would be a feat worthy of a Czar.

I also suggested the practicability of crossing the Pacific about one thousand miles below Bhering's Straits, where nature has written upon the ocean a beautiful sonnet; every line is a lovely island. The average distance between each of the Aleutian group is less than one hundred miles. On these galvanic batteries could be established, and a series of permanent submarine cables could be extended across the Pacific. I was therefore prompted to predict that the grand *thoughtway of the world* would run through both America and Russia.

A few months after these statements were made before this Association, we had the gratification of hearing that the Emperor of Russia had commenced the construction of a telegraph from St. Petersburgh to the Pacific. Our part of the work has been completed as far as San Francisco, thus bringing China and Eastern Russia twenty days nearer to us. The wires are now being laid from California to Oregon. How far the work had progressed in Russia was not known to us, but I now learn, from one of our distinguished guests, that the surveys are finished to the Amoor river. To complete the line, we must obtain permission to cross the British possessions bordering on the Pacific. When that is done, Russia and the Great Republic will be united by hooks of steel, which, it is hoped, will be emblematical of eternal peace and friendship between them.

Delano's Stove.

Mr. Frisbie then exhibited a model of Delano's improved coal-burning stove, alluded to by the Chairman, which he briefly explained, fuller details being reserved for the next meeting, as the hour devoted to miscellaneous business had expired.

Iron-clad Vessels of War.

The subject of iron-clad vessels was then taken up, when the Chairman introduced Commodore W. D. Porter, of the gunboat Essex, which lately achieved a brilliant success on the Mississippi river.

The Commodore said: The subject of iron-clads is one that is now engaging the serious attention of the civilized world. The gunboat Essex, to which I was attached, you are doubtless aware was coated on certain parts with sheets of India rubber, of a peculiar manufacture, one inch thick, and over this was placed plates of iron one inch thick. We have been in some fierce contests, which, in my opinion, proves that the use of an elastic substance between the iron and the wood, will largely increase the power to resist penetration, by enlarging the base of resistance wherever struck, by diffusing the force of the blow over a greater surface. In the action of the Essex, when she destroyed the rebel iron-clad Arkansas, she had to pass the batteries at Vicksburg, one of which mounted eighty guns. This battery is built where the river is very narrow, and the Essex was the first of the iron-clads that had to be placed under such a fire. The other miserable machines, called gunboats, were a disgrace to the country, as in action their wooden sides would be penetrated through and through. The Essex passed through this fire without serious injury, and was the first to gain a victory—a victory which resulted in destroying the most formidable iron-clad that the rebels had constructed. In doing this we had to pass by several small forts mounted with heavy guns. The Arkansas threw forty-eight heavy shots into us, notwithstanding which we delivered our fire, and drove in her casemates, killing thirteen of her men. In all her engagements the Essex had but one man killed. After I left her she was penetrated by a 120 pound ball, which passed clear through her. It of course broke the India rubber, but after the ball went through the India rubber closed up again to its original form. The Essex cost from first to last $186,000, and the Benton $286,000; this last named boat was covered with plain iron, and she was completely destroyed. In the case of the Merrimac and the first Monitor, the Merrimac got away from her, but with the Essex and the Arkansas, the latter was destroyed. The Commodore concluded by illustrating on the blackboard the armor of the Essex.

Mr. J. L. Jones gave the following

HISTORY OF THE ESSEX.

The Essex was originally a common ferryboat on the Mississippi river, and was originally called the New Era. She ran between St. Louis and Illinois town. While thus employed, a fire occurred on board, and her cabin and wheels were burned, and nothing left but the hull and main deck, which was badly charred. Her owners repaired her, and in the early part of 1861 she was purchased by government, and prepared for a cruise up the Missouri river, under command of Captain Rogers. She was a poor affair, entirely unfit to attack land batteries. Her casemates were mere breastworks, seven or eight feet high, with plate armor on her ports three-eighths of an inch thick, and only ten inches of wood.

On the 4th day of October, 1861, Commodore W. D. Porter having arrived in St. Louis, took command of her, and her name was changed to the Essex. She was placed on the dock at St. Louis, the hull thoroughly overhauled and tightly caulked, sponcils or false sides were put on to increase the buoyancy and help to sustain the casemates. Before her casemates were fairly commenced, she was ordered to Cairo. That there was a chance for a fight, was quite enough for Commodore Porter to induce a prompt departure, and after grounding several times on sand bars, she finally arrived at Cairo without casemates or materials from which to make them. But Commodore Porter had the will, and found the way to get supplies. The mills in that vicinity were all busy cutting timber for the other vessels belonging to the squadron under flag officer Foote, and the Essex being an independent craft, under independent command, and paid for out of the army appropriations, she did not get her share of materials. Commodore Porter was, therefore, obliged not only to superintend personally the work, but to use extraordinary exertions to obtain materials. I was at this time at St. Louis preparing the iron for the Essex, and fitting up the mortar fleet of thirty-eight scows with iron sides, pitched at an angle, to protect the men from the sharpshooters. In December, 1861, these boats, as they are called, were taken to Cairo. I shipped the iron for the Essex in a transport, and went, valise in hand, to Cairo to put on the plating.

I shall always remember the day I arrived. I had never had an opportunity of speaking with the commodore before, and now I found him, in the evening, on deck, busy as possible attending to the wood-work of the vessel. When I approached and told him what I was there for, he replied briskly "Well, Governor, here is a chance for you to pitch in;" and I did pitch in, up to my boot-tops in the mud on shore and up to my neck in work. I had but few tools to work with, and what I had not we did without, making such shift as we could. My forge was a dry-goods' box, filled with sand and mud; my anvil a plate of iron three feet long, thirteen inches wide and two and a half inches thick. All was loosely arranged on the deck of an Ohio river flat boat, in order to keep near the Essex, which would go one day to Mound City for lumber, and the next to Columbus to fire shells at the enemy. When not thus engaged she was at anchor, and then my boat was on one side of her, and a coal barge and lumber scow on the other, the cables of which were slipped when she went on any hostile expedition.

On the first of February I had the iron on, she started for the Tennessee river. I knew well by this time, from my intimate acquaintance with the commodore, when there was a prospect of a fight, by the way in which he wore his old black hat, and dragged his shawl about his shoulders. That evening he was unusually pleasant, and I knew from all the signs that something was going to happen; therefore I worked my men until twelve o'clock in putting on iron and removing tools from the Essex. It was understood that I could go on the expedition, but the great weight of tools and iron caused my flat boat to begin to sink, and both iron and tools were too valuable then and there to risk their loss. I reported the fact to the commodore, who said, "You had better remain and save things, and then, if you wish, come up on one of the tugs." I worked all that night and next day before I got things out of danger, and then reported to Capt. Pennock, and requested to be sent to the Essex; but as he told me there was no tug to spare, I had to remain at Cairo until the Essex returned with her boiler exploded, and her decks covered with dead and dying men. The first man I tried to see was the commodore. I could see where he was, but neither his face nor hands were visible. I believe the first words I spoke to him were: "Captain, are you badly hurt?" He replied: "Mr. Jones, is that you?" When I answered, he added: "Mr. Jones, we had a hard fight, but we took the fort. I feel badly on account of my men—they are brave boys. This will all be for the best; I will now be enabled to go to St. Louis and repair this vessel as I want to." He never spoke of his injuries for several days. I sat up with him several nights, until at length he told me I had better go to St. Louis and get things ready. I went the next day, but the Essex did not come for two weeks after. She arrived at St. Louis on Sunday the 26th day of February. The commodore was taken to the residence of his executive officer, Mr. R. R. Riley, where a consultation was held, for some days, about the rebuilding. We finally went to work as directed by the commodore, tearing the casemates down, and removing the machinery. The hull was put on the ways, and the stem was cut off, in order to lengthen her, and fix for putting in the machinery, all of which was done as fast as men could work. The hull was soon finished, launched, and taken to the wharf to receive the machinery, and while that was being put in, the carpenters were busy making the casemates of oak and pecan timber, as fast as it could be procured. I was constantly running and writing to various parts of the State to procure timber, it being rather scarce at that time in St. Louis. In the meantime the plate armor was being manufactured at the iron works in St. Louis. The iron was one inch in thickness on the forward casemates, but on the sides only three-quarters of an inch. The stern casemates were made circular and covered with plates three-quarters of an inch thick, slightly cupped or corrugated to give elasticity.

On the 6th day of July, 1862, she left St. Louis for Vicksburgh. As the iron work could not be done until after the wood work, it was the last finished; and it not being then completed I went with the Essex to Vicksburgh, and finished hanging her port doors on the 16th day of July, the morning after the ram Arkansas ran the blockade.

I will state one or two circumstances connected with her, and events that occurred. I was up very early getting my men at work, and before long I heard a heavy gun fired in the direction of the Yazoo river. This was enough to arouse the commodore, who had been sleeping on the upper deck under the awning, and without coat, vest or cap, he walked forward and asked where the firing came from. Before he got a reply, another gun was heard which answered the question. The commodore said, "Our vessels have found that ram." By this time the firing became rapid. I could see that the commodore had fight in him. He sent one of the officers to the chief-engineer, to know if it was possible to get up steam. He replied that it was impossible—that two sheets were out of one of the boilers. It now appeared, from the reports of the guns, that it was a running fight. The commodore ordered his executive officer to call the men to quarters, and load the guns, which was done; and, in a short time the gun-boat Tyler came in sight firing her stern guns, and then came the ram. She ran close in to the Louisiana shore, firing her long guns at the Tyler. Then she headed out in the river, and came on down through the fleet, firing right and left. The ram Lancaster had a steampipe shot away. About this time Commodore Porter ordered all hands below. I went with the rest, and saw no more of the ram until she got opposite the Essex. I was looking out of one of the ventilating port-holes, in the steerage cabin, to see the effects of the shots from the Essex on her. I saw some of the 10-inch and 11-inch shots fired from some of the vessels of the fleet strike her. When they struck, a blaze of fire, like that from a sky-rocket, issued from her sides. When she got opposite the Essex two guns were fired simultaneously, and the concussion was so great as to throw me down, whereby I lost observation of their effect. I immediately went below on the gun-deck, and saw the shot from the stern guns of the Essex strike her.

Commodore Porter sent me back to St. Louis next day with instructions to hurry up the rams LaFayette and Choctaw, which instructions I obeyed. Commodore Porter sont for a tug to tow him after the ram, but could'nt get them to undertake the job.

THE IRON CLAD MONITORS.

Mr. B. S. Osbon.—Mr. Chairman, it has been my fortune on several occasions to be on the monitor style of gunboats during action, and I can say that they behaved remarkably well, and, with the exception of the want of fresh air, they are all that is claimed for them. With the improvements experience has suggested I have no doubt they will be the most formidable vessels afloat. In order to show what they have actually endured I will read an extract from a copy of the official report of Commander John L. Worden, U. S. N., to Rear Admiral Dupont, in the action between the first Monitor and the Merrimac.

"We were struck by projectiles forty-eight times, to wit: sixteen times on the turret, three on the pilot house, seven on the smoke stack, seven on the side armor, eight on deck armor, once in gig, once in cutter, twice on boat spars, once on spare anchor, and had two flag staffs shot away."

After giving a thrilling account of the action and the sensations he experienced on board of this iron clad, Mr. Osbon proceeded to elucidate points of particular interest to the engineer and builder as follows:

I respectfully submit the following observations upon the effects of the shot upon this vessel. Upon the side armor above and near the water-line the plates were indented from one to two inches, bolt heads broken, the plates sprung apart at the upper edges, over the point of impact from one-eighth to three eighths of an inch, and where the point was near the ends of the plates they were in some cases cracked or split.

Upon the upper edge of the side armor and above the water-line, about midships, the indentations were in some cases greater, from one to three of the plates fractured or bent, and in one case driven under the edge of the deck plating so as to wedge it up half an inch. Upon the deck the indentations are in depth from one-quarter to one and a quarter inches, in length from three to twenty-two inches, and in width from one and a half to six inches. In some cases the plating was split under and about the point of impact.

The edges and corners of the plating were sprung up, the bolts started, and where the shot struck bolt heads they have been driven into, and in one case, three inches through the beam below. Upon the turret the indentations are from one-half to one and a half inches in depth, but no fractures have been made, and only one bolt was broken; and where the shots have struck near the ends or sides of plates they are very slightly sprung, but in no wise loosened or shaken.

No effect was perceptible inside except in one instance, when two ten inch shot struck, in rapid succession, within six or eight inches of each other, near the base of the turret; immediately after which it was found difficult to revolve the turret until it was raised by driving in the key three-quarters of an inch, when it again revolved freely.

The coincidence would suggest this difficulty to have been the effect of the shots, but as it is hard to see how such could have been the case, and as after the engagement, it was found that only one of the turret engines was working properly, it seems more fairly to be attributable to the latter cause.

The point of impact of these shot was almost directly against the front end of the left rail on which the eleven inch gun runs out and in, and their force was such as to spring this rail sufficiently to break square off two of the one and a quarter inch bolts with which the bottom plate of the front stoppers is fastened to it.

At the port of the fifteen inch gun the turret was found to be somewhat shaken, the plates being separated from each other, especially at the top, both edgewise and sidewise, in some cases quite one-eighth of an inch; and as the only hits which could have effected this were fair between both ports, and the eleven inch port is perfectly unshaken, it seems fairly attributable to the concussion.

The upper smoke stack is considerably riddled, but the jacket is only slightly indented and remains perfectly firm.

Upon the pilot house the indentations vary from one-quarter to three-quarters of an inch and have not injured the plates themselves; but although nut bolts were hit, seven were broke short off by the shocks, the bolt ends flung back violently upon the turret, and the inner ends, with nuts attached, flung violently across to the opposite side of the interior narrowly clearing those within. The fracture of these bolts exhibits an inferior quality of iron, quite in contrast with that of the bolt from the turret or the side armor.

The muzzle box and ring of the fifteen inch gun hold on well, only one bolt having given way in each. The box being found slightly sprung from the side of the turret on one side, but so far, only enough to require the bolts to be tightened up, and the ring remains firm and tight.

The engineer in charge reports when the guns were fired over the quarter, the deck and boilers vibrated so as to cause apprehension of damage to the numerous tube-joints of the boilers.

The hour for adjournment having arrived it was resolved to continue the discussion of Iron clad ships at the next meeting.

The Russian visitors having listened with marked attention to the whole debate withdrew at the close in company with Commodore Porter.

Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION
October 29, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. J. W. Chambers.

The miscellaneous business of the evening was opened by the chairman with the following remarks: A very interesting meeting of the American photographical society, was held at the N. Y. University on the fifth of this month, at which the results of an important series of experiments were presented in relation to the effect of different colored rays of light on vegetation. These experiments confirmed the investigations of Prof. J. W. Draper made several years before. The most interesting event of the evening was the exhibition of the largest photograph of the moon yet taken. It was made by Dr. Henry Draper with his new glass reflector. The advantage of using a large reflector instead of a refracting telescope, will be obvious when we consider the diverse qualities of the rays which make up the beam of light arising from the different rates of undulation of the ethereal medium. The red ray is produced by 458 millions of vibrations in a second; the violet ray by 727 millions of vibrations. The red ray is the least, and the violet ray the most refrangible; the yellow or most luminous ray is intermediate; the greatest heating power is in the red ray; the greatest luminosity is in the yellow, and the greatest actinic power is in the violet or beyond it, in what are called the invisible rays. Now it is apparent that these three rays being of different refrangibility, will, on passing through a lens, each have a distinct and separate focus; and that when the lens is fixed so as to present to the eye a perfect image, a sharply defined photographic image could not be taken, at the position of the eye, because the actinic rays, alone performing the chemical action which makes the picture, have net their perfect focus at that point. The larger the lens the greater will be the disparity in the foci. This objection to the lens in ordinary photographic work is not a serious one because the skillful operator can make the requisite allowance to produce a sharp picture; but when a large refractor is used to take distant objects, the difficulty in obtaining the proper adjustment becomes greater. The objection does not apply to the reflecting telescope.

The chairman illustrated upon the blackboard the refrangibility which produces the solar spectrum, and then requested Dr. Rich to read from the N. Y. Evening Post, the following description of

DRAPER'S GLASS REFLECTOR.

At a meeting of the New York photographic society, held in the chapel of the university on the evening of Monday, the 11th instant, a large number of our most intelligent photographers, and many gentlemen interested in the recent beautiful applications of this novel art, listened to the subjoined paper by Dr. Henry Draper, upon his arrangements for the photographic delineation of celestial objects. The successful achievements of this gentleman in his chosen department of investigation, have become known to many persons in our community, and much interest has been felt in them. To such the description will prove interesting.

Mr. Draper is a son of the distinguished Dr. John W. Draper, professor of chemistry in the New York University, and is associated with his father as professor of natural science in that institution.

Dr. Draper said, in the autumn of 1858, I determined to make the largest reflecting telescope in America. Its construction, together with the various improvements successively added, has occupied me up to the present time —more than five years. The instrument, which is nearly sixteen inches in aperture and thirteen feet in focal length, was intended to be devoted to celestial photography, and consequently contains many novelties especially fitting it for that purpose. A description of it was read at the Oxford meeting of the British association in 1860. It has since then been completed, and has now the largest silver reflector of any instrument in the world except that in the Imperial Observatory at Paris. The Smithsonian Institute is preparing to publish shortly a full account of it, which will contain the entire detail of construction.

THE REFLECTOR.

The reflecting telescope is greatly superior to the achromatic for photographic purposes. In my instrument a movement of the sensitive plate, one hundredth of an inch on either side of the true focus, visibly injures the image. In the great achromatic at Cambridge, on the contrary, the position of the plate may be varied over an inch without any noticeable change. The difference is simply that, while by reflection the visual and chemical rays both converge to the same focus, by refraction they do not. A sensitive plate, put where the eye sees the image sharply, produces a fine result in a reflecting telescope, but does not in an achromatic. Besides this, more light is reflected by a large silver mirror than an achromatic of equal size can transmit.

At first I used speculum metal for my mirrors, but abandoned it at Sir John Herschel's suggestion in favor of silvered glass, the reflecting power of the latter being ninety-three per cent., while that of the former is at the best but seventy-five per cent—a large achromatic only transmitting about seventy-five per cent. The glass mirror, too, weighs not more than one-eighth as much as the metal one—the one weighing sixteen pounds, the other one hundred and twenty-eight pounds. It is also greatly more permanent, for if the silver coating which covers the glass concave should by chance be injured, it can be dissolved off easily with nitric acid, and the mirror re-silvered in an afternoon, and this may be repeated indefinitely. A person making such a silvered glass reflector is content to take the greatest pains to produce a glass concave of the utmost perfection, for once that is obtained it need never be lost. The thin sheet of silver deposited upon it, only one two hundred thousandth of an inch thick, copies with the last degree of accuracy the glass beneath, and does not modify the figure of the surface, but only increases the refleting power from two or three per cent. up to more than ninety. This silver coating is transparent, and shows bright objects, such as the sun, of a light blue tint by transmitted light.

POWER OF MR. DRAPER'S TELESCOPE.

As regards the degree of excellence that can be reached by such telescopes, I can only say that mine can show every object that other instruments of similar size do, and more too. I can see the fifth component of *Debilissima*, which is the *minimum visibile* in Lassell's two-foot speculum, and the 18th magnitude pair near *b* Capricorn, discovered by Herschel's eighteen and a-half inch speculum. These demonstrate the light-collecting power of such a silver surface. In tests for sharpness of definition it will separate the blue component of Andromeda with a power of four hundred, and the instrument, on a favorable night, will bear three times that power.

It must not be supposed, however, that so excellent a result was obtained without labor. I have ground and polished more than a hundred mirrors, of sizes varying from nineteen inches to one-quarter of an inch in diameter. This has involved the construction of several distinct polishing machines; the earlier framed on foreign models, the latter original. Some of the large mirrors have also been polished and corrected for spherical observation by hand.

THE MOUNTING.

The mirror is sustained in a walnut tube hooped with brass and supported in a frame which holds the tube at both ends. This is to avoid the tremulous motions so common in large instruments. The eye-piece, or, what is the same thing, the place of the photographic plate, is stationary at all altitudes, and an observer has never to strain himself by awkward positions, but always looks straight forward. When photographs of the moon are taken, the telescope is not driven by clockwork, but is allowed to come to rest completely. The sensitive-plate alone is moved in a direction and at a rate to correspond with the moon's motion. The difference is, that instead of having to carry more than half a ton, the clock has only one ounce to move. Of course, there is no comparison between the precision of movement possible in the two cases.

THE CLOCK.

This is a clepsydra of peculiar construction, and has no wheelwork of any kind about it. It is free, therefore, from all irregularities produced by teeth, and also from those caused by the oscillating movements of a pendulum.

THE OBSERVATORY

at Hastings, Westchester county, is a building twenty feet square and twenty-two feet high, and is one-half excavated out of the solid rock, so as to keep the reflector at a uniform low temperature, and at the same time give steadiness and immobility to the telescope. It stands on a hill two hundred and fifty feet above the level of the sea, and, in consequence, escapes much of the fog which accumulates in the valleys around, and frequently, in the cold part of the night, fills them nearly full.

The dome which covers the building is sixteen feet in diameter, and is supported on a point at its centre, instead of on rollers or cannon-balls around the edge, as is usual. It is, of course, moved with much more ease, and, so far from requiring complicated wheelwork, can be turned around by a gentle pressure with the hand.

The entire management of the telescope is conducted from an observing-chair which follows the telescope. The instrument can be directed to an object, the dome shifted, and the observer himself moved to any desired part of the building by means within immediate reach, and which only require slight exertion,

THE PHOTOGRAPHIC LABORATORY

is attached to the observatory on the western side, only a few feet intervening between the telescope and developing sink. It contains all the requisite conveniences for taking photographs up to three feet in diameter, and is furnished with a tank which holds a ton of rain-water. This supply is procured from the roof of the buildings, which are on this account painted with a stone paint so as not to contaminate the water. Whenever an inch of rain falls I can collect the tank full. The total amount that can be secured in a year is about forty tons.

THE PHOTOGRAPHS.

The instrument has been in working order for eighteen months, but a large part of the time has been unused because of my absence with the Twelfth regiment in Virginia, and on account of the duties of the Natural Science Professorship in the University.

With my father's (Prof. J. W. Draper) assistance, I have, however, taken some very fine photographs during the past summer. Changes have been made in the photographic processes commonly used, in order to fit the pictures for bearing high magnifying powers. I have negatives which can be enlarged by a power of thirty-two without showing granulation or other defects to an offensive degree.

The photograph which I show you to-night is nearly two feet in diameter, and is magnified to two-hundred and ten times the size of the moon as seen by the naked eye. It is the largest that has ever been made. I have now another, however, still larger, in my observatory—nearly three feet in diameter—made under a power of three hundred and twenty. It represents the moon on a scale of seventy miles to the inch. In the picture before you, attention should be directed particularly to the Apenine range, Copernicus with his reflecting streams, the great groove from Tycho, the numerous craters with an internal cone, the irregularities visible in the bottom of the Mare Imbrium. But it is useless to particularize; there is an almost inexhaustible supply of objects for study and admiration.

The Society will see that, although celestial photography may be, as yet, only in its infancy, it is rapidly advancing. Every day is giving origin to improvements, and even now the limit of size in these pictures is rather owing to the great expense and difficulty of working such enormous plates than to any intrinsic defect of the images to be copied."

Upon the conclusion of his paper, Dr. Draper exhibited a photographic view of the moon's surface, the singular distinctness and beauty of which took the audience quite by surprise. It was a view of the moon when about half full, and presented a semi-circle of nearly two feet in diameter· The whole of this surface was pictured with great vividness, covered with long ranges of mountains, or dotted with huge volcanic summits into the depths of which one could look down. From one of these central points the lava streams could be traced for some eight inches, which, as an inch in length in the picture corresponds to a hundred miles upon the moon's surface, afforded occular evidence of volcanic agency through a line of eight hundred miles. From another, vast fissures were seen to radiate, which displayed evidence of convulsions reaching through an area of half that diameter. When it is considered that the largest photographs hitherto obtained of the moon are not more than from four to six inches in diameter, it will be perceived how great a triumph has been achieved by the science and skill which have been requisite for so great an improvement as a picture of twenty-two inches across. With the utmost patience and perseverance, and with every appliance of ingenuity, Dr. Draper has continued his work through a series of years, until he has produced pictures which far surpass the best achievements of European science in celestial photography. There is not another observatory in the world where any similar work can be done. Henceforth the world must look to America for its best views of the heavenly bodies, and the name of the young observer whose care and devotion have accomplished these brilliant results will have an honorable place in the history of the most beautiful department of astronomy.

Mr. Johnson.—It is stated in the description just read, that to correspond to the rate of the moon's motion, which would pass across the field in four minutes, but one ounce· is moved instead of half a ton. I would like to know the size of the negative.

The Chairman.—Dr. Draper told me it was an inch and a half in diameter.

Mr. G. Bartlett.—Was the silver deposited on the rear of this reflector, or on its surface?

Mr. J. Johnson.—It is deposited on the surface, and the thickness of this silver is but the 200,000th of an inch, which has to be slightly polished.

The Chairman.—In this country probably more discoveries will be made in astronomy than in any other, from the fact that we have a clearer sky. We have also many very fine telescopes, some of these are owned by private individuals. Mr. Clark, of Boston, has just finished an excellent one for Mr. Joseph Dixon of this Institute. Mr. Fitz, of this city, has lately made a very fine achromatic object glass sixteen inches in diameter. The vast benefit to mankind resulting from the discoveries in astronomy, are hardly appreciated. Our commercial prosperity rests upon the safety with which the ocean can be navigated; the correctness of the ship's chronometer and the precision with which the places of the sun and stars are determined, are the skillful mariner's main reliance in reaching the destined port.

Commodore W. D. Porter.—The expense of experiments in the science of astronomy are so enormous, that it requires a great amount of wealth to undertake them, but, notwithstanding this, there is probably no country in the world that has done so much as our own for this science, that is, in a private way. The largest photograph of the moon which I have seen was about a quarter of an inch in diameter, and afterward enlarged to some three inches. It is very encouraging now to hear we have made one nearly two feet in diameter.

Mr. J. Johnson.—At the last meeting enquiry was made as to what were the component parts of common pottery? I have since found that in a tube thirty inches long that there was four per cent. of flint, one and three-quarters of China clay, and one per cent. of feldspar; so it will be seen that it contains a large percentage of silex.

Delano's improvement in stoves, exhibited at the last meeting, was, on motion, referred to a select committee for examination.

The subject for the regular discussion was then taken up.

Iron-clad Vessels of War.

Mr. J. L. Jones.—In connection with this subject I have the honor to state a few facts, and offer some remarks. I feel my inability to discuss this subject before such an intelligent audience as this. I am but a youth, scientifically speaking, but I hope you will elucidate this subject in a more scientific manner than I am competent to do. I will endeavor to give you my views on this subject, and then call your attention to some facts connected with it. Nothing perhaps has been more clearly demonstrated, by the results of experience, than the necessity of providing some mode of rendering vessels of war impenetrable to heavy shots, and the effects of concussion, without incurring the necessity of loading them down with iron plates (or iron and wood combined), of such thickness and weight as to destroy the sea-going qualities of the vessel and endanger its safety when meeting a storm or heavy gale at sea.

To effectually incorporate all these principles or powers, I will say that I have great reason to believe the invention proposed by Commodore W. D. Porter and myself, has been demonstrated to be the best ever tried in modern times.

We propose, in our invention, to employ a series of plates of iron or steel alternately arranged with plates of vulcanized India rubber, or other elastic substance. I propose to apply it to the sides of a vessel in alternate layers, fastened with bolts, as represented in the drawings. These bolts are provided with elastic washers to prevent the nuts from being stripped off by the reaction which takes place after being compressed by the force of a cannon ball.

With reference to the pattern or proposed mode of rolling the plates, and the advantages to be derived from making them with ribs, forming grooves in the centre, and with ribs on each edge, I wish to remark that it will impart great rigidity to the plates, and assist in forming a continuous connection, and will enable constructors to impart the requisite rigidity to a vessel with less material than any other plan proposed. It also prevents the undulations of the vessel from cutting off rivets and bolts, and when used as planking for the hulls of vessels, with elastic cushions as represented in the drawings, will effectually prevent leakage. Bolts with nuts can be arranged so as to be adjusted at pleasure from the inside. We have never proposed (as some at first thought) to resist the impetus of a cannon ball with elastic substances alone, or by plating it on the outside of plate armor, but we propose to apply it in alternate layers with iron plates' When used in this manner, we have found that the balls have more work to do. The iron reacts and the base of resistance is enlarged around the point of impact, consequently diffuses the force of the blow over a greater extent of surface. This has been practically demonstrated on some of our gunboats on the Mississippi river, as well as by firing at a target, a few days since, in Washington city,—a target composed of four one-inch plates of iron alternately arranged with four one-inch plates of vulcanized India rubber. These plates were ninety-six inches long by forty-two wide; they were bolted to a block of oak twenty inches thick, with six bolts one and a half inches in diameter. The bolts were provided with elastic washers four inches in diameter and three inches thick. This target was placed against a perpendicular bank of clay, or as civil engineers would call it, "hard-pan," range twenty-five steps, or say seventy-five feet, at right angles with the muzzle of an eleven-inch Dahlgren gun, and fired at with a charge of thirty pounds of fine grain powder and a solid shot. Of course it was penetrated under such circumstances, but it broke the shot into pieces. I hold in my hand a piece of the shot. The hole in the surface or outside plate measured eleven and a quarter inches; in the second, the plug or piece punched out measured thirteen and a half inches in diameter; in the third, fifteen inches in diameter, and in the fourth, seventeen inches over the concave surface.

To get comparative results, a target of a similar size, composed of four one-inch iron plates, bolted to a similar block with ten screw bolts, set up in the same manner and of the same range, was also penetrated by a solid shot with the same change and gun. The holes in the four plates on this target were each a fraction less than twelve inches—for comparison I will calculate them at twelve inches—number of square inches in the four plugs punched out of my target equal 815 square inches; to square the diameter of the holes in the all iron target, we find them equal 576 square inches,—difference 239 square inches. To this must be added the number of square inches that would be equal to the force required to compress the rubber, and then we shall have the means of comparison. I am not very precise you will see. My reasons are, that the Assistant Secretary of the Navy, Mr. Fox, told me they would be published, and I did not collect all the details.

A target composed of a $4\frac{3}{4}$ inch solid plate, screwed to a similar block of wood, was also fired at with an eleven inch solid shot. This plate was badly broken, as you will see from the diagram, and here is a piece of each target; also some of the India rubber.

Having given you the details of the effect of an eleven inch shot striking plate armor at seventy-five feet, arranged according to the plan we proposed, but set against a clay bank, I will state that whenever we have fired at two inches thickness of iron and one of rubber, backed by two feet of oak, inclined at an angle of forty-five degrees, the shots have been either deflected or rebounded, as I will show you by affidavits of the gentlemen that were on board the gunboat Choctaw. I will also state that my target at Washington city, was not put up in the manner and at the range I desired. Here is a drawing of the target as I proposed to erect it before I received an order from Admiral Dahlgren for its construction. The range proposed by me was three hundred yards for the first shot, and to fire at it on a boat, so that the range and position could be changed but Mr. Fox was of opinion that we could not get practical results without setting the target against a bank at a range of fifty to seventy-five feet.

There are good reasons for believing that iron plates lose their fibre or become crystallized from the effects of the percussive impetus of shot.

The iron on the target composed of iron and India rubber and fired at as described, was convex some three inches by the reaction of the elastic cushions, round the point of impact. Yet no bolt was broken in consequence of the elastic washers. Elastic substances under plate armor will successfully resist concussion. This is demonstrated every day on our railroad cars by the vulcanized India rubber car spring.

The advantages to be derived from elastic backings is no longer a theory. Its value has been well tested. It is in use on the forward casemates of the gunboats Essex, Lafayette and Choctaw; and to Commodore W. D. Porter belongs the credit of introducing it in the navy, by giving it a good practical test on the Essex, the first iron-clad vessel fitted out in America.

I will now read the statement and affidavit of Mr. Kilpatrick, dated

Haines Bluffs, *April* 30, 1863.

Mr. Jones—Dear Sir : We have just been fighting, three hours and forty minutes. The Choctaw stood it pretty well. She was struck on the turret six times, once with a ten inch shell, when it struck it dented the iron and rebounded back, and struck the deck, where it bursted, setting fire to the deck, forward of the magazine. The men had to go out and water it out, the rebels firing heavy at them. This proved the elasticity of your patent gum. The other four shots glazed without doing any harm. There was one ten inch shot which struck her on the angle of the turret crown, it went right through, but you must remember there was no gum behind the iron on this part of the turret, as we only put the gum on the front of the turret. She was struck seven times on the star-board side, two of the shots went through into the cabin. Where there was no gum, it smashed the iron so badly, that I had to put the men to work and cut it out, and patch it. The officers thought the gum was of no account, so they would not have it on all the important parts, but they think it is great stuff now. I forgot to mention the distance that the captain supposed we were from the rebels' batteries; he said they were 400 yards off. We were struck fifty-six times in all. The chimneys are completely riddled, and the wheel-houses have got their share. By the by, I was nearly forgetting to tell you there was one shot, a sixty-four pounder, it went through eleven feet of solid timber, in the wheel-house. There was no iron here. The officers thought when they saw that, that your gum and iron is a great institution.

I remain, yours truly,

ALEXANDER KILPATRICK.

To Mr. J. L. Jones, *St. Louis, Mo.*

State of Missouri, *City of St. Louis*, ss: Alexander Kilpatrick being duly sworn according to law, doth depose and say, that he was on the United States gunboat Choctaw, on the 30th day of April, 1863, in her engagement with the enemies batteries on the Yazoo river; that a portion of the casemates on said vessel was on the plan invented and placed on her by J. L. Jones, of the city of St. Louis, and Commodore Wm. D. Porter of the United States Navy, and were provided and placed on the said vessel by the same; that such portions of said casemates, were covered according to such plan with gum elastic cushions, and a portion, not so covered with such gum elastic, it penetrated and destroyed the same. And when a shot struck a part so covered, it simply dented the iron and rebounded upon the deck and exploded, doing little or no damage to the deck; and deponent further saith, that this and the statement signed by him dated Haines Bluff, April 30th, 1863, are and each of them is true to the knowledge of deponent. ALEXANDER KILPATRICK.

Sworn before me, this 28th day of July, 1863.

Benjamin F. Hickman, *U. S. Com., Mo. Dist.*

Commodore Porter.—In corroboration of Mr. Jones' remarks, I will now submit the following statements of actual experiments made on our western waters the results of which strongly indicate that it is practicable to unite impenetrability with buoyancy.

Plate Armor for Sea-Going Vessels, Uniting Buoyancy with Impenetrability.

With reference to this subject it is known that hard, solid, and ponderous substances, as well as those of a soft, light, fibrous, or elastic nature, (when the fibres are interlocked by compression,) will successfully resist the penetration of projectiles, the former substances operate by opposing direct resistance; the latter, by the elasticity of the mass, gradually checks the force, and by the power of adhesion and reaction, enlarges the base of resistance round the point of impact, consequently diffuses the force of the shot over a greater extent of surface; and a cannon ball, when projected with great velocity, has both weight and impetus, or "vis viva." Theoretically, therefore, it would seem, that a combination of both the above mentioned powers and principles of resistance to penetration, would not only be effectual, but at the same time admit of that buoyancy so essential in sea-going vessels; and for the purpose of fully availing ourselves of both these principles of resistance, it is proposed to employ a series of iron and vulcanized India rubber plates, alternately arranged, as shown by the accompanying drawings; for it is manifest that the force of the blow will thereby be diffused from the point of contact, over a larger extent of the surface of the inner plates, and therefore enlarge the base of resistance to the penetration of the superior plate.

The correctness of the above theory was inferred from the well-known action of India rubber, when vulcanized and combined with metallic substances, or fibrous tissues, and from the analogous action of all vegetable and metallic fibres when free to act. In order to test the correctness of some of the principles above suggested, as far as practicable at the time, experiments were made in St. Louis, Missouri, in the months of February and March, 1862, with the following results :

First. A conical ball of lead, weighing half an ounce, was fired at a target of pine wood, covered with a plate of iron one-sixteenth of an inch in thickness, at a distance of eighty feet, and at an angle of forty-five degrees ; the ball penetrated the iron, and went several inches into the wood. Then one-fourth of an inch of vulcanized India rubber was placed behind the iron plate, and at the same range and angle a ball of similar dimensions, and same charge of powder, merely indented the iron plate, without penetrating through it ; this was repeated in like manner several times with similar results.

Second. A steel bolt, one inch in length, and 9-16 inches in diameter, weighing one 21-480 ounces, was fired from an Enfield rifle, with a full charge of powder, at a plate of iron three-eighths of an inch in thickness, backed by four inches of oak. This bolt penetrated the iron plate, and stuck into the wood backing, but rebounded at an oblique angle with great violence, without penetrating the plate when a plate of vulcanized India rubber half an inch in thickness was placed between the iron plate and wood ; this was also repeated with similar results. The range in these experiments was fifty feet. It was then determined to place "mixed," or fibrous "India rubber" plates under the armor plates of the forward casemate of the gunboat Essex, then in process of reconstruction. Her casemates were erected on the gun deck, at an angle of forty-five degrees, and were covered with iron. The forward casemates were composed of twenty-six inches of oak, and one inch of India rubber, covered with iron plates one inch in thickness the after casemates were of oak sixteen inches, covered with similar armor plates ; the midship case mates were also of oak and pecan, of similar thickness, covered with iron plates three-fourths of an inch in thickness. Neither of the latter portions of her casemates were covered with India rubber. The armor plates were all manufactured from similar stock of metals, and by one party.

In the action between this gunboat, commanded (at that time) by Commodore W. D. Porter, and the batteries at Vicksburg, Port Hudson, and other points on the lower Mississippi river, the forward casemates were struck repeatedly by solid shots, varying from thirty-two to one hundred and twenty-eight lbs., some of which were fired from rifle guns at short range. None of those shots penetrated the forward casemates; but some of the larger ones indented the armor plates, started the wood work, and broke in pieces, showing that the force of the shot was entirely spent.

The after casemates, covered with iron of the same thickness, made by the same manufacturers, but without India rubber, were penetrated in several places by shots fired from the same batteries, and similar guns ; in all, over one hundred and twenty-five shots, struck this vessel at about the same range, proving that this thickness of iron affords no protection when placed immediately upon a solid timber support. In fact, the same may be said of two and a half and three inches of iron, if we may form a correct judgment from the results of the actions between the gunboat Galena and the batteries at Fort Darling, on James river, Va., and the gunboat Carondolet and the rebel ram Arkansas, on the morning of 15th of July, 1862; also the engagement between the gunboat Benton, commanded by the late Captain Gwin, and the batteries at Haines' Bluff, on the Yazoo river. This vessel was struck twenty-nine times in this engagement. The first named vessel's armor plates that were penetrated were three inches thick; the latter two vessels belonging to the Mississippi squadron, were protected with armor plates two and a half inches thick. The second engagement (on the morning July 15th) was witnessed by your memorialists, who examamined the armor plates after the action. These plates were penetrated by eight inch shot, the range being about the same as that when the Essex passed the batteries at Port Hudson, September 7th, 1862.

Now, if one inch of iron, and one inch of India rubber between the armor plates and the timber (on the Essex) effectually resisted the penetration of the before mentioned shots at short range, (of which fact there can be no possibility of doubt,) when we take into consideration the width of the river, position of the vessel, and the locality of the batteries from which these shots were fired, as well as other evidences of the facts, what may be expected of a casemate composed of from three to four sheets of iron, of one inch in thickness, and the same number of vulcanized India rubber plates interposed between them, the iron plates being clamped together by means of flanges and grooves, (see accompanying drawings,) so as to afford a mutual support, and to act as one continuous sheet. The probability is that the power of resistance to penetration of this combination would only be limited by the ability of the support or casemate to sustain the momentum of the shot, and support the plates.

The ability of such fastenings, as before mentioned, to prevent a vessel from being swamped, going to pieces, or springing leaks during a heavy sea, will depend only upon the depth of hold, width of beam, and the manner in which the work is put together, and not merely *upon bolts and rivets, as has heretofore been the case.*

In order to further illustrate and explain this proposed plan, for example, when we wish to drive a nail through a hard seasoned plank, we naturally lay it upon and in close contact with a solid support, in order to concentrate the effect of the blow upon the fibres of the wood at the point of contact, and cut through them without incurring that resistance which their fibres could exert to lessen the effect of the blow, if the elasticity of the support was such as to allow the fibres to act, and diffuse the force of the blow from the point of impact. So with the fibres of iron, for their reaction is most powerful, if suffered to react. To prevent this in cutting or punching a plate of iron, the most unyielding and solid support that can be possibly devised is sought, in order to obtain the greatest effect of penetration. These are familiar instances, but they show conclusively that iron plates should never be laid immediately upon a solid support if we wish them most effectually to resist the penetration of a cannon ball. It is true that in punching a hole through an iron plate, we place it immediately over a hole or cavity; but we do this that the sharp edges of this hole in conjunction with the sharp edges of the punch may act as a pair of powerful shears to cut out the plug of iron, at the same time to admit of its being forced through the plate. But we must bear in mind that, in order to effect this object, the fibres of the iron plate must be secured from reaction by placing it upon a firm and unyielding support, and that otherwise it would be impossible to punch the plate.

Thus, from all the facts that can be collected bearing upon this subject, we are irresistibly led to the conclusion that whatever may be the means or instruments employed to penetrate iron plates, one thing is essential, that the fibres of the iron must be prevented from reaction, in order to avail ourselves of the greatest effect of the percussive force applied, and that if we wish the plate to oppose its maximum powers of resistance to penetration, some elastic substance must be interposed between the iron plate and its solid support to allow the fibres of the iron to react.

There is good reason to believe that the interposition of an elastic substance between the iron and the wood, renders the elasticity of the latter more available by preventing the fibres of the wood from being cut and divided, thereby increasing the power to resist penetration by enlarging the base of resistance at the point of impact, on the principle of diffusing the force of the blow over a greater extent of surface.

The advantages obtained by this proposed combination, as well as the quantity of materials required to resist different sized shots, can be approximately determined by calculation based upon hypothesis, or experiments. For example: A cannon ball of a given weight, projected by a given force, exerts certain power at a given range or distance from the guns. With data similar to this before us, it will be an easy matter to make experiments sufficient to determine all that is necessary, provided the departments are not satisfied with experiments that have been made.

It may be urged by some that similar experiments have been made at the navy yard in Washington, or at other points, and that the results were unsatisfactory, This will not be surprising, when the facts are known, as one of our acting rear-admirals remarks in an official communication, to which he says he "was a witness, in Washington city. Heavy turrets with four-inch iron plating were placed in front of a Dahlgren eleven-inch; also the same with a two-inch coating of India rubber. At direct firing and at an angle of 35 degrees, the gutta-percha was proved to be a useless expense, having no effect whatever to resist the shot and rifle shell, both of which were repeatedly tried."

It must be admitted that "gutta-percha" is a "useless expense," for this purpose, as it is hard and somewhat brittle; consequently will not successfully resist percussive impetus, and is not as susceptible of being compressed as vulcanized India rubber. Also a plate of India rubber one inch in thickness, is said to have been "placed behind a four (4) inch plate of iron, backed by sixteen inches of oak, at fifty feet. The first trial was at an angle of forty-five degrees; *the shot did not penetrate.* The second was perpendicular, the shot penetrated wood and all." This firing was also done with eleven-inch solid shots from a Dahlgren gun. Had these four-inch plates of iron been manufactured into sheets one inch in thickness, of good tough and fibrous qualities, and alternately arranged with sheets of vulcanized India rubber, as herein proposed, there is no doubt but that all the shots fired would have been as successfully resisted as was the first one mentioned in the second experiment.

The true value of this, or any other plan, can never be fully determined by men who will employ thick iron and gutta-percha as a substitute for thinner plates and India rubber. The difference in the cohesion of the fibres of thick plates, and those of thin ones, was fully determined at the Laclede Iron Works, in St. Louis, on plates two and a half inches in thickness and plates one inch thick; both being made from similar stock, and underwent the usual manipulations due to the manufacturing of plates of similar thickness. Each plate had the outside fibres cut with a chisel, and was then put under a trip-hammer and subjected to a bending operation. The two and a half inch plates broke with the first stroke of the hammer; it required several blows to break the one-inch plates, as they would bend back and forth before breaking.

Aside from the beforementioned experiment, there are other important reasons why iron should be applied to the sides of a vessel in separate plates, more effectually to oppose resistance to penetration.

First. It is well known that thick plates of iron cannot be forged or rolled of the proportionate strength of thin plates, for the reason that the former are liable to become granulated in the operation, more full of flaws, and not of so homogeneous a texture as thin plates.

Second. It is also well known that two surfaces of iron offer greater resistance to penetration than one, because the surface of each plate, to the depth of one-sixteenth or one-eighth of an inch, is much harder and tougher than the interior.

Third. The joints can be broken by separating the plates.

Fourth. By the interposition of the India rubber plates, space is afforded to interlock and strongly connect the iron plates with each other, by means of flanges and grooves, which not only enlarges the base of resistance to shot, but adds strength to the sides of a ship.

Fifth. When the iron plates are thus interlocked and connected together, less thickness of timber is required to sustain them.

Sixth. When all the iron plates are strongly connected, so as to support each other, and the sides of the ship, the iron plates cannot act as a dead weight, and tend to tear asunder the sides of a vessel longitudinally, as has been found to be the case when the iron plates are not so connected.

In conclusion, you are herewith furnished with the relative capacity of oak and iron to resist penetration; also with the specific gravity of the materials herein under consideration.

It has been shown, by experiments, that one inch of good tough wrought iron would oppose about as much resistance as thirty inches of partially seasoned oak.

The specific gravity of such a plate of iron is 7.788, and its weight forty pounds per superficial foot.

The specific gravity of James river oak, *when well seasoned,* is 0.759, and will average in weight sixty pounds per cubic foot; the same may be said of western burr oak.

The specific gravity of India rubber is 0.933, and when manufactured into plates, as proposed, will weigh about eight pounds per superficial foot.

The hour for adjournment having arrived, no opportunity was given to hear objections to the foregoing plan.

The subject of "Plate Armor" was therefore continued for the next meeting. Adjourned to November 12th.

American Institute Polytechnic Association,
November 12th, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

New Submerged Paddle Wheel.

A model of a new propeller, by Mr. Leer, of Boston, was exhibited and examined.

The Chairman.—The principle involved in this model appears to be that as the wheel turns it tends to throw the water out from it by centrifugal force, aided by atmospheric pressure. A hollow is made in the shaft to let the air in and thus press the water out of the center. There are two wheels, one each side, and placed a little above the stern, and worked horizontally, which adapts them to boats of light draft. Mr. Leer claims that this method is superior to the side wheel and the ordinary propeller. But the only novelty I can see in it is in having the hollow in the shaft, without which there would be a pressure of fifteen pounds on the square inch, which the wheel would have to work against. The other parts of this wheel are not new. They are embraced in that known as the "Hunter wheel," which I believe is now abandoned. There is a loss of power with every paddle wheel and screw propeller. But in the Hunter wheel, which is virtually a paddle wheel partly enclosed in a case, the loss of power is great, because a portion of the water is carried entirely around the wheel and against the inside of the case. Ericson's "Iron Witch," a North river steamer, tried about fifteen years ago, had two small partially submerged paddle wheels. It was a failure.

Mr. G. Bartlett.—The Hunter wheel is well known by Mr. Leer, and he claims that his plan remedies the defects in it.

New Furnace for Boilers.

Mr. Manton exhibited a model of his furnace for utilizing the waste heat which passes up the chimney of steam boilers.

Mr. J. K. Fisher.—The operation of this invention consists in causing the heat and smoke, after it has passed through the furnace, instead of being thrown out into the air, to circulate through a mass of fire bricks and pieces of scrap iron, or any other material capable of absorbing heat. By this means the mass is heated to some 1,300 degrees, when a damper shuts off the heat from passing through this material, and turns it into a similar mass adjoining. The air which feeds the furnace is now made to pass through this heated mass of scrap iron and broken fire bricks, which supplies the fuel with hot air, and thereby effecting considerable economy. As has been stated, there are two of these air heaters, which are used alternately, so that when one is feeding the fire with hot air the other is absorbing the heat, which would otherwise pass up the chimney. In ordinary practice eight pounds of water is vaporized by a pound of fuel, and sometimes twelve pounds in stationary engines. Mr. Clark, who has given considerable attention to this subject in regard to locomotives, says that the maximum is fourteen pounds; but in locomotives, which vaporize as economical as any, about one-third of the heat is lost. Now it has been estimated that the cost of the fuel of a steamship, after being placed on board, averages $15 a ton; so if this apparatus of Mr. Manton would save one-third of the heat the gain would be immense, about 400 tons on a trip, which would be some $12,000. It appears there is a great quantity of fuel to be saved by the hot blast. This system of causing the waste heat to pass through a mass of material, that will absorb it instead of being thrown out into the air, seems to possess many advantages, and is worthy of a careful investigation.

The Chairman.—This plan is essentially the same as Sieman's.

Mr. Norman Wiard.—I have no doubt but that this plan is capable of economical results, but the same may be attained by increasing the fire surface of the boiler, and the question is, which is the best system.

Mr. Manton.—With my apparatus we can have the gases to pass out of the chimney at a nearly uniform temperature, and under no circumstances need we loose more than fifty degrees of heat.

Mr. Benjamin Garvey.—We are sometimes apt to suppose an advantage when there really is none. In this apparatus of Mr. Manton the economy is effected by power expended in another direction. In order to get heat in this case, we must have a great draft, which can only be had by a blower, and this involves an expenditure of power. In regard to enlarging the fire surface to attain greater evaporation, I will say that it has been found in recent practice that by shortening the flues of locomotive boilers the vaporizing capacity has been largely increased.

Mr. Fisher.—With regard to statement which I made from the report of Mr. E. K. Clark, it appears that about one-third of the heat is lost, so that we have that proportion of the horse power sent up the smoke pipe in a locomotive. As to the use of blowers I may say that on locomotives the natural draft is of no account, so much so that when standing they do not burn one-eighth of the fuel. Mr. Gurney tried several experiments in order to effect a draft. He ventilated a mine with a jet of steam, but found it cost much more than by using a blower. The jet expended more power than the mechanical appliances used to work a blower, so he abandoned it.

IRON-CLAD VESSELS OF WAR.

The subject for the regular discussion was here resumed.

Captain R. G. Macdougal exhibited a model of his gunboat. He said: The guns are arranged on a circular table, similar to that used for turning locomotives, and there are nine ports arranged in different directions, and the table is turned by steam. One gun is fired every fourth time. This gives the gun time to cool. There are two propellers, so as to turn in a narrow stream or on a small circle. Captain Macdougal here made a diagram on the blackboard, showing the construction of the different parts of his gunboat, which he explained very minutely.

THE DUNDERBERG.

Dr. J. B. Rich.—Through the kindness of Mr. Webb I visited the famous ram "Dunderberg," now building at his yard, and there can be no doubt but when completed she will be a most formidable vessel. Her extreme length is 380 feet; breadth, 70 feet; depth of hold, 23 feet. She has two turrets, 11 inches thick, each having two 15-inch guns, and eight 11-inch guns in casemates. Her tonnage is 7,000 tons. The length of the ram is 60 feet. She has two cylinders of 100 inches diameter, and will be 6,000 horse power. Her screw is of 32 feet pitch, and will be capable of a speed of 15 miles an hour. Thirty-one feet from top of casemates to keel. The braces are 14 inches wide and eight inches thick. The hull is divided into several water-tight compartments. The casemates are built at an angle of 60 degrees, and in order for a ball to go through them it will have first to pass through several feet of coal, as the casemates are lined on each side by the coal bunkers.

THE MONITORS.

Mr. B. S. Osbon.—A very successful arrangement in the monitor style of gunboats is that in the overhang of the vessel there are placed anchor wells, in which anchors are hung, so that wherever it is desirable to take a position, these anchors are dropped without being seen by the enemy. The monitors were built with a view to harbor defence only, but the government sent them down south to batter down forts, some of them sand forts. At Charleston they have been struck over 1,000 times, and still there has been no material injury inflicted on them, and I may say they look like a pair of prize fighters faces, showing evidence of some rough handling, but nothing more. There has not been a single man killed in a monitor yet. It is a matter of no small pride to know that we have revolutionized the mode of modern warfare, and that we are building to-day an iron ship that will surprise the world. As a vessel replete, with all the modern appearances for defence and offence, I think the iron ship Dictator stands first. And the reason why England and France did not interfere in our affairs long before this, was the failure of her iron-clad ships whenever during their trial trips they went beyond smooth water. Our monitors being of light draft can be managed in shallow and narrow channels, and so maneuvered as to get a large ship where it cannot turn and then go at her, and if advisable our monitors can get away easily. I have no doubt that the Dictator would go right through the English Warrior. We can imagine what it would be for a ship to be struck on the side with an iron ram twenty feet long. We are also making great improvements in guns. I have seen a gun that can be fired in a seaway with perfect safety, and fire and recoil and go back to its right position. The greatest trouble at sea is with the large guns, the 11-inch, which cannot be kept in their places, but go rolling about the vessel. I have seen them tied up with every rope to be had on board, and I have even timed them, and found them to roll 24 times in a minute. We had a boat on the Mississippi called the Miona, which we named the "Miasma," for she would not go in any way. Vessels like these have been a source of annoyance in all our expeditions. If we look at the lists of prizes captured, we will find that most of them were made by merchantmen. The failure to take Charleston was, in my opinion, much the fault of the Navy Department. They sent down there a nondescript which they called a "Devil," and without the least explanation or orders how to use it. The want of confidence and the want of orders was felt everywhere. The monitors did not go up to Charleston on account of the obstructions placed in the water at the entrances, and these obstructions are a wonderful arrangement. Yet strange to say the inventor of these same obstructions, a man of undoubted loyalty, presented his plans of them to the Navy Department at Washington, but they declined having anything to do with them. After this, by some means unknown, they found their way into rebeldom, and we now see the result.

Mr. J. L. Jones, St. Louis, Mo.—Mr. Chairman, it was my intention, so far as I was concerned, to discontinue this subject on the last evening we met, but as there seems to be a deep interest manifested on the part of the gentlemen attending these discussions, I am willing to do all I can to throw light on this important subject. In fact I am fully impressed that the time has arrived for the voice, as well as the sound of the hammer of the mechanic to be heard if we wish our nation to advance in the art of nautical architecture.

It is true vessels have been built that have come nearer being invulnerable to cannon balls, in the United States, than in any other country on the face of the globe. While this must be admitted, I wish to ask the important questions: Are they seagoing vessels that will live in a storm or heavy gale at sea? Have ample provisions been made to prevent the injurious effects of concussion? Have there been proper mechanical arrangements applied to prevent the bolts from breaking, when acted upon by the sudden impetus of cannon balls? Have the constructors adopted any device that will prevent the iron plates from being broken, or the fiber of iron from being granulated or crystalized by percussive impetus? Have the plates been secured so as to prevent their being torn off?

So far as I am informed, I will answer, *No*. And to verify my answer I have only to call your attention to facts which were read at the last meeting, by Mr. Osbon, from the official report of Capt. Worden; as well as to facts that have appeared in the public prints; also to Mr. Osbon's own admissions. He, Mr. O., said that he was on board one of the Monitors while in action, that he received several wounds inflicted by fragments of bolts, that had been broken by the percussive impetus of the enemy's shots. That he was, while in the vessel, knocked down by concussion, and that many plates were cracked, broken, &c.

Similar accidents to these can and have been prevented, by using the Compound Armor invented by Commodore Porter and myself. We have explained to you the manner in which it was done on board the gunboat Essex.

If these proofs already offered are not satisfastory, one can easily make the experiment himself.

Take a thin piece of iron and lay it upon a piece of vulcanized India rubber, one-half or three-quarters of an inch thick, and drive a nail through it if you can. Then lay the same iron plate on a solid block of wood and drive the nail through the iron. I think after you do this you will be irresistably led to the conclusion, that granite walls and banks of "hard pan" or clay are not the best materials for the backing for plate armor ; and that we are not advocating the advantages of our invention with mere conclusions drawn from theory alone.

I am in favor of practical tests ; but the best way to test plate armor is to put it on the sides or casemates of a vessel, and then go into action on her, yourself, and see and know what effect the enemy's shots have on it.

If we can make plate armor which will resist the enemy's shots, without overloading our vessels with iron, that is all that is required. The enemy's shots have been resisted by the compound armor, with less weight than has been done with any other plan.

I am not aware that Congress enacted any law compelling our Navy Department to build vessels entirely of iron ; or to adopt any one man's plan, to the exclusion of others ; or that all targets must be set against banks of clay, at a distance of 50 to 75 feet, and be fired at with 30 lbs. of powder and solid shot weighing from 165 to 175 lbs. It is to the inventors of the country at large that we must look for good practical plans and models for vessels of war ; and fair experimental tests must be our guide in constructing vessels of war.

I was looking over some books the other day, in your library, and to my utter amazement, I found in volume 2d, pages 230 and 231, in a work entitled "Transactions of the Society for the Promotion of Useful Arts in the State of New York," published at Albany, in the year 1807, an illustration and description of a vessel with a revolving turret. The mode of operating or revolving the turret is fully explained ; about the only difference between that plan and our present Monitors turrets is that it is proposed to revolve the monitor turrets with steam, whereas the inventor of the revolving turret, Mr. Abraham Bloodgood, of Albany, in 1807, proposed to revolve it by "hand or other means." *

I have not come here to discuss the subject of iron-clads, with the view of objecting to the plans of certain inventors. It has been known for ages that a mass of wrought iron of *immense thickness* could resist a cannon ball.

I have endeavored to discuss and explain to you the advantages of the plan proposed and tested by Commodore Porter and myself ; and to explain where and how we can improve on the plan for iron-clads now used in the United States. I hope I have not given offence by explaining our plans or by alluding to the defects in the plans of others, in the several meetings of this association which I have attended. My time and services, are now as they have been since the commencement of this rebellion, at my country's disposal. All I ask, of some of the officials at Washington, is to treat me as a loyal American citizen should be treated, who is trying to serve his country to the best of his ability. I can truly say, I have never tried to diddle the United States Government out of "greenbacks." I have neither asked for nor received anything, except my daily wages for work done ; and these have been no more than I was accustomed to receive for my services seven or eight years ago.

The discussion of the use of an elastic substance, as a backing for plate armor, was continued by several members; the current of opinion being rather against its feasibility.

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* The invention of Mr. Bloodgood was a floating circular battery to be anchored at its centre; and not a sailing vessel with a revolving battery upon it.

"The Bursting of Guns," was the subject selected for the next discussion. Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
November 19*th*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

NEW STEAM SLIDE VALVE.

Mr. T. Reenstjerner exhibited a model of his improved steam slide valve.

Mr. B. Garvey.—The object of this invention is to relieve the valve as much as possible of the pressure of the steam upon it, and also to avoid the waste of steam which occurs in long steam passages, by reducing them to a very short length; just sufficient to provide a clearance for the piston within the cylinder. To accomplish these results, steam is admitted under the interior of the valve through a steam belt running round the cylinder; the steam then enters the ports, which are just so much shorter than the same ports on the valve seat as the travel of the valve. The steam exhausts at the ends of the valve into the steam-chest. In order to keep the valve against the valve-seat, a piston is used on the upper part of the valve, which has an area slightly exceeding that of the ports. The steam pressure on this piston is taken off by friction rollers on the valve-chest cover. As may be seen, this valve has very little more fitting surface than a common valve, and will cost but a trifle more. The valve is nearly balanced, and what friction there is, is mostly rolling friction. The usual steam passages, as now made, are here dispensed with, by which a great saving of steam is here effected; and the cooling surface, which, for each stroke in the common engine, has to be cooled off by the exhaust steam and heated again by the live steam entering, is thus reduced to the least possible area.

Mr. J. K. Fisher.—A valve made partly on this principle, by Mr. Buchanan of this city, was tried on some locomotives, but did not succeed, and has been abandoned. The last I heard of it was that the engines worked better with the old valve.

On motion, Mr. Fisher, Dr. Rowell and Mr. Bartlett were appointed a committee to examine this valve.

Mr. Shaw, of the New York Lead Company, 63 and 65 Centre street, exhibited several specimens of their patent tin-lined lead pipe, the discussion of which was reserved, as it would form the subject of the next discussion.

THE CAUSE OF THE BURSTING OF GUNS.

The Chairman.—As the discussion of this question involves the force of gunpowder, it would be proper to present, at the outset, the latest views of those who have given the subject special attention. A very able paper appeared in the last number of Silliman's American Journal of Science and Art, written by Prof. F. A. P. Barnard, which Dr. Rich has kindly consented to read.

ON THE EXPLOSIVE FORCE OF GUNPOWDER.

Authorities very widely differ as to the degree of strain to which heavy guns are subjected in experimental or in service firing; and still more widely in their estimates of the expansive force which gunpowder would be capable of exerting could it be exploded in a space incapable of enlargement, which it exactly fills. The magnitude of the differences may be illustrated by the following examples:

In the work published in 1742 by Benjamin Robins, entitled "New Principles of Gunnery," the absolute expansive force of gunpowder exploded within its own bulk, is set down at one thousand atmospheres. This estimate was founded on certain experiments which may briefly be described as follows: First, by actually collecting the gases generated by the combustion of a given weight of powder, Mr. Robins inferred that these gases, reduced to the actual temperature previous to explosion, exceed, under the ordinary atmospheric pressure, the bulk of the powder by which they are produced, in the ratio of 244 to 1. In order to ascertain the effect upon elasticity produced by the heat of combustion, he drew out a portion of a musket barrel into a conical form, leaving an orifice at that end of only one-eighth of an inch. The other end being closed, he subjected the apparatus to the highest heat of a furnace, and then immersed the conical end, which he first stopped with an iron plug, in water. After the tube had sufficiently cooled, he removed the plug and allowed the water to enter. The amount of the fluid found in the tube after the complete restoration of the original temperature, compared with the entire capacity of the tube itself, furnished the data for computing the expansion which the air had undergone in the furnace. The relative volumes of the air in the tube before and after expansion, when reduced to a common temperature, were determined, by a series of experiments of this kind, to be as 796 to 194⅓. Combining the data, Mr. Robins computed the maximum possible elasticity of the gases generated in the firing of gunpowder, at 999⅓ atmospheres; or, in round numbers, at 1000. It is here assumed that the heat of burning gunpowder is no greater than that of an ordinary furnace.

At a later period, this subject was investigated by Gay Lussac. According to his determination, the bulk of the gases generated in the combustion exceeds the original bulk of the powder, in the ratio of 450 to 1. He estimates the temperature of combustion at 1000° C; and computes the resulting elastic pressure at more than 2100 atmospheres. Dr. Hutton, relying upon the approximate correctness of a formula which he had constructed for computing the velocities of projectiles fired from a gun, and taken as data the velocities actually observed, as ascertained by Robins' pendulum, concluded the maximum pressure to be somewhere between 1700 and 2300; thus substantially agreeing with Gay Lussac. The results of Dr. Gregory are not materially different from this, the maximum pressure being put by him at 2250.

In the year 1797, Count Rumford communicated to the Royal Society of London the results of an elaborate series of experiments upon the force of gunpowder, in which the estimates of pressure had been deduced, among other methods, from the observed effect of small charges of powder in lifting heavy weights. He puts the greatest force actually observed at about

55,000 atmospheres; but, as the charges filled but a portion of the cavity beneath the weight, he infers that the maximum pressure in a space entirely filled with the powder ought to be as high as 101,000 atmospheres.

The processes and results of Rumford are criticised by Piobert (Traite d'Artillerie, Paris, 1847), who regards them as unsatisfactory. According to his own determination, the maximum pressure should be about 7500 atmospheres.

Dr. Young, in his lectures on natural philosophy, quotes Euber, Lombard and D. Bernoulli, as giving for the same pressure the value of 10,000 atmospheres. He, himself, seems to favor a higher estimate, between 30,000 and 50,000 atmospheres. In Nichols Cyclopedia of the Physical Sciences, under the article "Gunnery," we find this statement: "Various experiments indicate the expansive force of gunpowder to be between 25,000 and 32,000 atmospheres." No authorities are cited. In volume 22, second series of this journal, is contained an article on the "Pressure of Fired Gunpowder," by W. E. Woodbridge, M. D., in which are detailed the results of some interesting experiments made by the writer, in connection with Maj. Mordecai, U. S. A., at the Washington Navy Yard, upon the pressure which guns actually endure in firing round shot. These experiments are deserving of study, and will be examined hereafter; but they are not to the point immediately before us.

Mr. Woodbridge, however, states that he exploded twenty grains of rifle powder in a cast steel cylinder, capable of enduring a pressure of 6200 atmospheres at the maximum—the powder entirely filling the cylinder, and the explosion being effected without escape of gas, without bursting the cylinder. Mr. Woodbridge also quotes Gen. Antoni, of the Sardinian army, as authority for the statement that fine military powder, fired in a cylinder of half an inch diameter and height, with no opening but the vent through which it is fired, exerts a pressure of 1400 to 1900 atmospheres.

In the Encyclopedia Britanica, last edition, article gunpowder, Mr. Tomlinson, assuming that the gaseous products of the combustion of gun-powder are carbonic oxyde, sulphurous acid and nitrogen, exclusively, computes a theoretic enlargement of volume as 1:787·3. Assuming further that the elevation of temperature is such as to treble this volume, he makes the maximum pressure 2360 atmospheres.

The interesting reports of Capt. Rodman upon metals for heavy guns, and upon the qualities of cannon powder, published in 1861 by authority of the Secretary of War of the United States, contain statements of experiments in which powder was actually exploded in a shell which it could not burst, but which it entirely filled, and of the force actually developed under these circumstances. In these experiments there was an orifice, one-tenth of an inch in diameter, through which the powder was fired, and through which the gases might of course more or less rapidly escape. The highest pressure registered by the gauge employed for the purpose, contrived by Capt. Rodman himself, and described in the volume, was 185,000 lbs. per square inch, equivalent to more than 12,000 atmospheres. For certain reasons which he mentions, Capt. Rodman thinks that this is below the true pressure, so that he concludes, "I should feel perfectly safe in fixing the inferior limit of the pressure per square inch due to the combustion of gunpowder in its own volume, at, in round numbers, 200,000 pounds."

On the other hand, Mr. Norman Wiard, of New York city, a practical gun-founder of large experience, who has given a great deal of attention to the subject experimentally, in a recently published essay, expresses very strong conviction that all the estimates of the maximum possible pressure of gunpowder heretofore made are greatly in excess; and that this maximum pressure cannot exceed 743 atmospheres, or about eleven thousand pounds to the square inch.

These examples are cited, not with any intention to exhaust the list of authorities, but simply for the purpose of illustrating the wide differences between them. None of the results presented can be said to rest upon entirely unexceptionable data; and among those which most largely differ, are some which seem to possess almost equal claims to acceptance. In the year 1857, however, there was published in Poggendorf's Annalen, for November, a paper by Messrs. Bunsen and Schischkoff, of Heidelberg, entitled "Chemische Theorie des Schiesspulver," in which this subject is investigated with a thoroughness never before attempted, and the data are presented for determining the maximum force of gun-powder in a form which seems to leave nothing to desire. This force is computed by them to be equal to 4373.6 atmospheres. The objects successively aimed at by these investigators were to ascertain, first, by the most rigorous methods of analysis, the nature of the several products resulting from the combustion of powder, and their relative quantities; secondly, the volume of the gaseous products reduced to 0° C., as compared with the original volume of the powder; thirdly, the volume of the fixed products, both at the temperature of experiment and that of combustion; and finally, the absolute amount of heat evolved in the combustion, and (considering the capacities for heat of the several substances present and their respective weights) the actual temperature of the whole mass in the instant of combustion.

As it appears, in this investigation, that the fixed products occupy no inconsiderable portion of the space which the powder originally filled, it follows that the conclusions of Robins and Gay Lussac, had they been in other respects exact, would have materially underrated the maximum theoretic pressure; since these gaseous products, in an absolutely closed space, are by so much the more compressed as the cavity is practically diminished by the presence of the portions which are not gaseous.

It is impossible to read the article of Messrs. Bunsen and Schischkoff, without being strongly inclined to believe that their conclusion is as near the truth as it is possible, in an inquiry of so difficult a nature, to arrive. At the same time, one cannot fail to observe, in reading it, that they have furnished the means of testing the correctness of their result, by taking the velocities which projectiles of given weight, fired from guns of given length and calibre, are observed to have acquired at the moment of leaving the gun; and computing, according to recognized principles of physics, the initial pressures which would be necessary to produce such velocities.

In making such a computation, one assumption must be made, (at least in the first instance) which is not true; and which in so far as it is not true, will have the effect to make the computed maximum less than the real maximum pressure. This assumption is, that the powder is completely fired before the projectile begins to move. The same assumption was made by Robins and by Hutton, and it is implicitly involved in all the velocity formulæ which are found in treatises on artillery or on ballistics, at the present time. It being assumed, then, that all the gas which the powder is capable of producing is set free before the ball begins to move, we require to know, in order to determine the velocity it will generate in the projectile, the following particulars, viz: the original bulk at the atmospheric temperature and pressure, its capacity for heat both at constant pressure and at constant volume, the length of the bore of the gun, the part of this length occupied by the cartridge, and the weight of the projectile. All these data except those which relate to the gun and projectile, are furnished by the investigation just cited; and the remainder may be deduced or directly taken from any table showing the initial velocities obtained by experiment, and the dimensions of the gun by means of which they were obtained.

Without such an investigation no determination of the probable maximum pressure of gunpowder which could be deduced from the observed velocities of projectiles thrown by it, could be entitled to any confidence. The rate of diminishing pressure of the mixed gases during expansion, depends on the ratio of their capacities for heat at constant pressure and at constant volume, and of this nothing had been previously known. The formula of Hutton and the formula in present use for calculating the iniatial velocities of cannon balls, are founded on the law of Mariotte for the relation of the pressure of a gaseous body to its density. This law furnishes a curve of pressures in which the ordinates diminish as the bulk increases much less rapidly than the real pressures; and accordingly, for the production of a given effect, it makes the higher pressures too low to compensate for the excess of the lower.

The United States Ordnance Manual furnishes a variety of examples of the initial velocities observed in firing round shot from smooth bore guns of different calibres. The calculations which follow are founded on a selection from these examples. In order to obtain a formula suitable for the purpose, we suppose a to represent the length of the space measured along the bore, which the liberated gases fill, provided they are entirely set free before the shot begins to move; x the variable length, measured in like manner, which they fill at any time after the motion has commenced; F, the initial force by which the shot is urged; v, the velocity acquired, and g, the ratio between the capacities for heat of the gases as taken at constant pressure and at constant volume. This ratio requires to be so often referred to that it seems to be desirable to have some mode of indicating it without circumlocution. The term *thermo-dynamic index*, appears to be sufficiently significant, and is believed not to be preoccupied. It is therefore employed in the following discussion to denote the ratio in question. The conditions of the problem give immediately the following, which is founded on Poisson's well known law for the pressure of expanding gases:

$$dv = \mathrm{F}\left(\frac{a}{x}\right)^{g} dt. \quad \text{And we have also } dx = v dt.$$

Prof. Barnard proceeds to find the value of v^2 and afterwards to find the value of F, as compared with gravity, p representing the initial pressure of the gases in atmospheres estimated at 14.72 lbs. per square inch, Ws the weight of a shot, Ss its specific gravity, v its diameter in a fraction of a foot, Wp the weight of the powder, Sp its specific gravity, 62.5 lbs. the weight of a cubic foot of water, G the force of gravity represented by a velocity of 32 1-6 feet per second, c the calibre of the gun in a fraction of a foot, L its length of bore in calibres, l the length of the cartridge, and n the ratio of the weight of powder to the weight of shot. After presenting a series of equations from which the required values are deduced, (here omitted for want of time,) the professor proceeds as follows: We will now attend for a moment to the method of deducing the value of p, *a priori.*

The materials employed in the manufacture of gunpowder are mixed nearly in the proportion of one equivalent of saltpetre, one equivalent of sulphur and potassium, and three equivalents of carbon. If, in the combustion, the sulphur and potassium be supposed to combine, we may assume the results to consist of one equivalent of sulphid of potassium, one equivalent of free nitrogen, and three equivalents of carbonic acid. One grame of powder will furnish, at 0° C of temperature, and 0 mm .760 of pressure, 82·50 c. c. of nitrogen, and 248·40 c. c. of carbonic acid; in all, 330·92 c. c. in volume of gaseous products. Any other probable combination of the gaseous elements will not increase this volume. The investigation of Messrs. Bunsen and Schischkoff demonstrate, however, that the sulphid of potassium forms but a small portion of the fixed residuum. The sulphur is, to a great extent, oxydized, and forms sulphate and sulphite of potassa, and a portion of the carbonic acid unites with the same base. A small portion of the nitrate appears also to be undecomposed. One grame of powder, accordingly, furnishes but 193·1 cubic centimetres of gas.

The gunpowder employed by these experimenters contained an excess of saltpetre above the theoretic proportion, and a deficiency of carbon. The sulphur was also somewhat deficient, and there was about three-and-a-half per cent. of oxygen and hydrogen nearly in the proportions to form water. The gaseous products constituted 0·3138 of the total weight, and the solid residuum 0·6804.

In the gunpowder employed in the American military service, the saltpetre is slightly in excess, and also the carbon, the sulphur being in deficiency. It is probable that the results of its combustion would vary somewhat from those here detailed, but not to such an extent as very materially to affect the calculations which follow. In experiments of the Heidelberg investigators, the gunpowder was burned under the ordinary pressure of the atmosphere. It may be objected that, in the chamber of a gun, other forms of a combination of the elements may take place; but, though this is possible, it is hardly supposable that greater power would, in such a case, be developed. A combustion which should produce a greater volume of gas would probably be attended with a less development of heat; so that as much as would be gained in elastic force by one of these circumstances, would be lost by the other.

The specific gravity of the fixed residuum at 18° C, was found to be 2·35. By a method of determination devised by the experimenters, which is not described but in which they have full confidence, the specific gravity at the temperature of combustion is ascertained to be 1.5. The temperature of combustion itself was determined by very careful experiment. The details of the method pursued are interesting, but it is unnecessary to present them here. It was found that the heat developed by burning a given weight of powder would be sufficient to raise the temperature, of an equal weight of water 619°. 5 C. The specific heat of the mixed products of combustion, was found at constant pressure and at constant volume, by multiplying the specific heat of each ingredient by the amount per cent. of it present, and taking the sum of the products. The elevation of temperature produced by the combustion, on supposition of no enlargement of the space occupied by the powder, is then obviously found by dividing 619°. 5 C, by the specific heat at constant volume This specific heat being 0·18547, the elevation of temperature is equal to 3,340° C.

The specific heat at constant pressure is at the same time 0·20698. In order to obtain the thermo-dynamic index of the gaseous portions of the mixture, the sum of the products formed as just described by the several capacities at constant pressure of those portions, must be divided by the sum of the products similarly formed, by the capacities at constant volume. These sums are respectively 0·07672 and 0·05520. Their quotient is 1·39, which is the value of the thermo-dynamic index.

In order to find the original bulk of the gases, or the magnitude of the space within which they are compressed if liberated without expansion, we consider that the bulk of the powder before combustion will be expressed in cubic centimetres by $\frac{Wp}{Sp}$; a cubic centimetre of pure water at maximum density weighing one grame, and Wp being expressed in grames. In like manner if *Wr* be the weight of the fixed residuum, expressed in grammes, the bulk of the residuum will be $\frac{Wr.}{Sr.}$ The space occupied by the gases will therefore be $\frac{Wp}{Sp}-\frac{Wr}{Sr}=0\cdot50872$ c. c. As at 0° C and 0mm .760 of pressure, the same gases occupy 193·1 c. c. per gramme weight of powder, the elastic force due to difference of volume only would be expressed by

$$\frac{193\cdot1\ Wp}{\frac{Wp}{Sp}\ \frac{Wr}{Sr}}=(\text{if } Wp=1 \text{ gramme})\ \frac{193\cdot1}{\frac{1}{1\cdot039}-\frac{0\cdot6806}{1\cdot5}}=\frac{193\cdot1}{.50872}=379\cdot58.$$

Thus, the pressures in atmospheres would be 379.58 if there were no elevation of temperature produced by the combustion.

The original bulk of one gramme of powder being $\frac{1}{1.039}$=96246 c. c., and the space originally filled by the gases being 0.50872 c. c., the relative original bulk of gas and powder will be $\frac{.50872}{.96246}$=0.52856, which is therefore the numerical value of a, in the foregoing formula, when l is unity.

The volume of the gases having been reduced to zero of temperature, the effect of an elevation by combustion of 3340° C, may be computed by assuming the absolute zero at —274° C, which is the latest determination as given by Rankine. Putting then p for the pressure we shall have

$$p = 379.58\left(1 + \frac{3340}{274}\right) = 5006{\cdot}5 \text{ atmospheres.}$$

This value exceeds that found by the experimenters themselves by 632.9 atmospheres. The difference is owing almost entirely to the difference in the assumed specific gravity of the powder, the experimenters having taken this at .964, while we have employed the value 1.039. When gunpowder is not shaken down, its specific gravity is always less than one and when well shaken is always more than one. The U. S. Ordnance Manual (edition of 1850), gives .929 for the specific gravity of loose powder, and 1.039 for that of powder well shaken down. It is obvious that, in a gun, we must adopt the higher value. There is also a slight difference between the determinations, owing to a difference in the assumed place of the absolute zero. The co-efficient of expansion employed by the experimenters is $(1 + 0.003660t,)$ which corresponds to a zero at —273°.225 C. Adopting their specific gravity with the zero at —274°, the pressure would be 4364, or about ten atmospheres less than the determination of the experimenters.

We are now in condition to apply the formula above given to the computation of the velocities which the initial pressure just assigned ought to be capable of generating in projectiles of given weight, fired with given charges of powder from the guns of given calibre and length; and also the initial pressures which would be necessary, in similar cases, to produce the velocities actually observed. The examples which follow, twenty-five in number, are taken from the U. S. Ordnance Manual, and exhibit the results actually obtained in experimental firing at the Washington navy yard. As the guns used were all smooth bores, and the projectiles round shot, the observed velocity is corrected for the loss by windage. The formula for this correction, which experiment has suggested, is

$$C = A\frac{c-b}{c},$$

in which C is the correction, c and b have the values assigned them in the foregoing formula, and A is a constant determined by observation, and is usually put =6 400 ft.

The particulars which enter into the calculation for each form of gun are the following:

KIND OF GUN.	Calibre in inches.	Windage in inches.	Length of bore in cal.	Weight of projectiles in pounds.	Charges in lbs.
6 pdr. field	3.67	0.09	15.67	6.15	1.25, 1.50, 2.00
12 pdr. field	4.62	0.10	16.00	12.3	2, 2·5, 3, 4
12 pdr. siege..........	4.62	0.10	22.38	12.3	2, 3, 4
12 pdr. 25 cal.........	4.62	0.10	25.00	12.3	2, 3, 4, 5, 6, 7, 8
24 pdr. siege..........	5.82	0.14	18.56	24.25	3, 4, 6, 8
32 pdr. seacoast.......	6.40	0.15	16.78	32.3	4, 5, 33, 8, 10·67

In the tables which succeed are given the values of v, which result from the formula when x is made equal to l—l + a; that is when it has its value, which belongs to it at the moment the shot leaves the muzzle.

KIND OF GUN.	Number.	Approx. val. of n.	Number of vols. expansion.	Velocity observed.	Veloc. cor. for windage.	Velocity computed.	Dif. obs. and comp. velocity.	Dif. cor. and comp. velocity.	Pres. in. atm. which would produce cor. velocity.
6 pdr. field	1	1.5th	34	1439	1596	1368	-71	-228	6820
	2	1.4th	28+	1563	1720	1465	-98	-255	6899
	3	1.3d	21-	1741	1898	1623	-118	-275	6842
12 pdr. field	4	1.4th	43+	1370	1508	1257	-113	-251	7208
	5	1.5th	34+	1486	1624	1373	-113	-251	7008
	6	1.4th	29-	1635	1773	1471	-164	-302	7274
	7	1.3d	21+	1834	1972	1630	-204	-342	7329
12 pdr. siege	8	1.6th	61	1378	1516	1280	-98	-236	7023
	9	1.4th	90+	1674	1812	1505	-169	-307	7259
	10	1.3d	30	1906	2044	1674	-232	-370	7461
Long 12 pdr	11	1.6th	68	1444	1582	1287	-157	-295	7567
	12	1.4th	45	1742	1880	1515	-227	-365	7713
	13	1.3d	34-	1951	2089	1688	-263	-401	7673
	14	5.12th	27-	2098	2236	1825	-273	-411	7518
	15	1.2d	22	2239	2377	1937	-302	-440	7539
	16	7.12th	19-	2300	2438	2030	-270	-408	7222
	17	2.3d	16+	2324	2462	2107	-217	-355	6833
24 pdr. siege	18	1.8th	68-	1240	1394	1127	-113	-267	7665
	19	1.6th	50+	1440	1594	1270	-170	-324	7892
	20	1.4th	33+	1723	1877	1489	-234	-388	7959
	21	1.3d	25	1870	2024	1653	-217	-371	7511
32 pdr. seacoast	22	1.8th	60+	1271	1421	1124	-147	-297	7994
	23	1.4th	45	1430	1580	1266	-164	-314	7799
	24	1.4th	30-	1640	1790	1482	-158	-308	7302
	25	1.3d	22	1780	1930	1642	-138	-288	6913

Mean of pressures 7369

The columns "approximate values of n" and "No. of volumes expansion," are introduced for convenient comparison. The second consists of the values of $\frac{x}{a}$ at the moment of the expulsion of the shot. These numbers are approximate, like the values of n. In the calculation the exact values are in all cases employed. The column of pressures contains the computed initial pressures which would be necessary to produce the velocities corrected for windage. The results presented in the preceding table are certainly surprising. While anything like a close agreement between computation and observation was hardly to be expected, every reason for anticipating a discrepancy would indicate that the computed velocities should be in excess and not in deficiency, and the computed pressures in deficiency and not in excess. The formula assumes that the gases are fully developed, before the shot begins to move. In point of fact, we know that the combustion of cannon powder is far from complete, even when the shot leaves the muzzle. A medium sized cannon powder has grains three-tenths of an inch in diameter, the largest sized from six to nine-tenths. Piobert gives, as the conclusion arrived at after a very long and elaborate series of experiments on the rapidity of combustion of powder in lumps, that the combustion advances at the rate of half an inch per second; his conclusion is, moreover, positive that neither heat nor pressure affect, to any sensible degree, this rate. A grain of powder 0. in. 3 in diameter, would therefore be nearly a third of a second in burning, while Rodman's experiments prove that the shot of a 42-pounder, with ten pounds of powder, is but little more than five thousandths of a second in the gun after the fire takes the cartridge. We may, also, by a very simple process of calculation, show that Rodman's experimental determination cannot be far from correct. The actually observed velocity with which a round shot leaves a 12-pounder gun of sixteen calibres length, when the charge is a quarter of the weight of the shot, is 1635 feet; the length of the bore is six feet, which is, therefore, about the space through which the pressure acts on the projectile; if this pressure were constant, it would expel the ball in the time which it would take the ball to move twelve feet after leaving the gun—that is to say, in $\frac{12}{1635} = \frac{1}{140}$ of a second nearly. But as the pressures near the muzzle are very far below the mean, those near the breech must be greatly above, or the time must be much less than this calculation gives. Since, therefore, the powder is not by any means completely burned, not even probably on supposition that Piobert's conclusions in regard to the effect of heat and pressure on rapidity of combustion are erroneous, before the elastic force of the developed gases ceases to act on the projectile, we have reason to suppose, that if our determination of maximum theoretic pressure is correct, the velocities computed by our formula will be much in excess of those obtained in actual experiment. Again, all the circumstances of the actual experiment, of which the calculation takes no account, are in favor of excess on the side of the calculation; the weight of the sabot, the envelopes of the gun, the resistance of the air, &c., all these particulars, if allowed for, would reduce the computed velocity. It is evident that there is error somewhere, either in the determination of the volume of gas, or in that of the heat developed, or in the assumption that the relation of elasticity to volume is the same under all pressures. What is known of carbonic acid, however, under high condensation at ordinary or at low temperature, does not encourage the belief that its elasticity can, under any circumstances, increase more rapidly than in the inverse ratio of its bulk (temperature remaining) constant, but makes it nearly certain that any change which should occur in this respect would be in the opposite direction.

There is one particular in which it is probable that our formula ought to be corrected. We have employed the thermodynamic index of the expanding gases, 1.39, as determined by the Heidelberg experimenters and by ourselves; in doing this we have disregarded the fact, that the fixed products of combustion which have originally the same high temperature as the gaseous, are intimately mingled with the gases in a state of minute division, that is in the form of smoke. A true thermodynamic index for the time being, must take account of the capacities for heat of the entire mixture, and will, therefore, be the quotient of the joint capacity at constant pressure, which is 0.20698, by the joint capacity at constant volume 0.18547. This quotient is 1.116 nearly. By substituting this value for v, instead of the former, we obtain results in which the differences are generally in the right direction, though by no means so great as we should be led to anticipate. These results are exhibited in the following table:

KIND OF GUN.	Number.	Approx. val. of n.	Number of vols. expansion.	Velocity observed.	Veloc. cor. for windage.	Velocity computed.	Dif. obs. and comp. velocity.	Dif. cor. and comp. velocity.	Pres. in. atm. which would produce cor. velocity.
6 pdr. field	1	1.5th	34	1439	1596	1687	248	91	4483
	2	1.4th	28+	1563	1720	1790	227	70	4621
	3	1.3d	21-	1741	1898	1954	213	56	4722
12 pdr. field	4	1.6th	43+	1370	1508	1563	193	55	4659
	5	1.5th	34+	1486	1624	1689	203	65	4629
	6	1.4th	29-	1635	1773	1793	158	20	4896
	7	1.3d	21+	1834	1972	1958	124	-14	5081
12 pdr. siege	8	1.6th	61	1378	1516	1618	240	102	4396
	9	1.4th	40+	1674	1812	1865	191	53	4724
	10	1.3d	30	1906	2044	2046	140	2	4999
Long 12 pdr	11	1.6th	68	1444	1582	1635	191	53	4688
	12	1.4th	45	1742	1880	1888	146	8	4965
	13	1.3d	34-	1951	2089	2073	122	-16	5081
	14	5.12th	27-	2098	2236	2217	119	-19	5092
	15	1.2d	22	2239	2377	2331	92	-46	5206
	16	7.12th	19-	2300	2438	2422	122	-16	5074
	17	2.3d	16+	2324	2462	2498	174	+36	4863
24 pdr. siege	18	1.8th	68-	1240	1394	1431	191	37	4754
	19	1.6th	50+	1440	1594	1591	151	-3	5027
	20	1.4th	33+	1723	1877	1829	106	-48	5274
	21	1.3d	25	1870	2024	2000	130	-24	5127
32 pdr. seacoast	22	1.8th	60+	1271	1421	1421	150	0	5007
	23	1.6th	45	1430	1580	1577	147	-3	5023
	24	1.4th	30+	1640	1790	1811	171	21	4891
	25	1.3d	22	1780	1930	1976	196	46	4774
Mean of pressures									4882

The mean of the computed pressures, in this table, is somewhat below the assumed pressure, that is to say, the difference is in the right direction but it is not a sufficient difference. It would produce a mean effect upon velocity equal to $\sqrt{\frac{4882}{5007}}$=about one eightieth of the whole. But if we take the time in the gun at 0s .006, and admit that the conclusions of Piobert, in regard to the rapidity of combustion are not absurdly in error, we shall be forced to allow that only a fraction of the possible elastic energy of the generated gases comes into play, and that therefore the computed velocities sought (*if we have correctly determined the maximum pressure*) are very greatly in excess of the velocities actually observed, and should probably exceed them a number of times.

It is probable that further experiment would prove that contrary to Piobert's opinion, the combustion of gunpowder must go on more rapidly in the chamber of a gun, than under the circumstances in which it is most easy directly to observe it. But it is not by any means probable that the rapidity of burning is ever great enough to permit us to discard the consideration of time from among the elements which must enter into this problem. On the contrary the pressures registered by Rodman's indicator when rifle powder and large grained cannon powder are successively fired in the same gun and with the same weight of projectile, show that the evolution of gas in the second case is much less rapid than the first, and observers who have witnessed the firing of the fifteen inch guns state that the mammoth powder grains are visible in full combustion after leaving the muzzle of the gun.

Without a more extended examination of the subject than it has been found practicable to introduce into the present article, (designedly brief) we should not perhaps be justified in stating an absolutely definite conclusion in regard to the maximum pressure which gunpowder is capable of producing; but it seems impossible to reconcile the actually observed velocities of projectiles thrown by it, with any supposition which should place this maximum at less than ten thousand atmospheres, or one hundred and fifty thousand pounds per square inch.

If we admit such a maximum, however, we find ourselves on the other hand, obliged to discredit, to a certain extent, the results of the very able and elaborate investigation of Messrs. Bunsen and Schischkoff, and to suppose that they have underestimated the volume of the generated gases or the amount of the heat developed. In the specimen of powder examined by them the charcoal was in unusually small proportion. This may have produced a sensible effect upon their results, by leading to a larger production of sulphuric acid and a smaller of carbonic. Still, after making every reasonable allowance for this consideration, we find it impossible to draw from their analysis a satisfactory explanation of the mechanical effects which gunpowder actually produces, and it seems exceedingly desirable that their investigation should be repeated.

One observation may here be made in regard to the allowance commonly made in calculation, for the effect upon the velocity of projectiles, of the windage of guns. In the table above, examples one, two and three are similar in all respects except windage, to examples five, six, seven. The computed velocities are, therefore, in the parallel cases, as they should be, almost exactly equal. But the actually observed velocities materially differ, No. 5 being greater by forty-seven than No. 1; No. 6 greater by seventy-two than No. 2; and No. 7 greater by ninety-three than No. 3. In the first set of examples the windage is about one-fortieth and in the second one-forty-sixth. The higher observed velocities correspond to the less windage. And it is observed that the effect on velocity of difference of windage seems to increase with the charge. It is thus rendered experimentally evident that it is a great error to make the correction for loss of velocity by windage a constant for all charges in the same gun. That this is an error was indeed *a priori* probable. It is somewhat remarkable that it should have been so long permitted to stand unquestioned.

Mr. G. Bartlett.—In the article just read, Prof. Barnard goes through his summary of the experiments made to ascertain the force of gunpowder, all of which he condemns, and then says that there has been a set of experiments made by Bunsen which are so satisfactory as to leave nothing to desire. Now we have had a full account of these experiments last winter at one of our meetings by Prof. Joy who was then our chairman. He said that the experiments of Bunsen were made in the open air. Now I want to raise the point, how important the difference is between burning gunpowder under and not under pressure. Bunsen gave a long list of the products of burnt gunpowder, among which was the nitrate of ammonia, this in itself would utterly destroy Bunsen's experiments. We know the volume of the gases, supposing the temperature to be the same, would fill a larger space than he gives, and we know the chemical changes to be different by burning powder under an intense heat. So I take it, these experiments are entirely vitiated on this point. What is necessary to take into account is the capacity of these several substances for heat. Gases expand according to a certain law, and according to an increase of temperature, but these substances take different quantities of heat, that is their capacity for heat varies with the temperature, and for these immensely high temperatures their capacity has never been ascertained. Prof. Barnard goes through two experiments to find out the force of gunpowder under chemical and mechanical action. The chemical is at fault, but the mechanical is easier to find out, and the result appears to be 150,000 pounds on the square inch.

Mr. Norman Wiard.—At the time experiments were made at the Springfield armory, they found that musket barrels had only a pressure of 5,000 pounds on the square inch, and that a gunbarrel was not permanently enlarged by powder, but is by water. In the efforts to launch the "Great Eastern," in England, they used hydraulic presses in which there was a pressure of 5,000 pounds on the square inch, although these presses burst, yet guns made at the same foundry in which these presses were built stood the force of gunpowder, but were burst with water.

The Chairman.—The method of making gunpowder is very old, and in early times it was made without any knowledge of chemistry, for all the substances of which it is composed are found in nature; one of these substances, nitre, exists in many places in this country, and was very abundant in the great cave in Kentucky. It is quite remarkable that the proportions for making gunpowder, which are now deemed the best, are the same as the earliest known receipts. These are 75 parts saltpetre, 12·5 sulphur, 12·5 charcoal. Although the American, French and English powders are not precisely alike, that is probably most effective which, on explosion, unites in true chemical proportions.

Mr. Stuart.—The nitrate of potash is found in Japan, in greater abundance than in any other part of the world.

Mr. Wiard then read a paper on the bursting of guns.

Mr. Clinton Roosevelt, made a diagram on the black-board of the longitudinal section of a gun, showing the peculiar fracture in guns that burst and the place where it most occurs, and said : The principal point at which guns burst is at the breech ; now if it was the heat that exploded them, they should be torn apart through the whole length of the gun, and not at the breech, for the heat is ever greater at the mouth than at the breech ; the reason that they do not burst throughout goes to show that it was pressure and not heat that produces this effect.

Prof. Everett.—In regard to the remarks of Mr. Bartlett, in the early part of the evening, as to the effect of burning gunpowder in the open air and in a close vessel, I should say that there would be a great difference in the products, and it is strange that it has not been noticed before. And therefore, to reason from Bunsen's experiments would be very much like the boy who is said to have asked his Professor how he found out the size of the moon, and was told that he guessed the first half and multiplied that by four.

Mr. J. K. Fisher.—It appears strange to me that the pressure of gunpowder should be put down at 150,000 and 200,000 pounds on the square inch, when 150,000 pounds is the maximum strain that the best steel will stand, and a pressure of 80,000 pounds will crush cast-iron. From this it would seem that 200,000 pounds ought to blow a cast-iron cannon to pieces almost instantly.

Mr. Wiard.—Almost every one I have spoken to on the subject of the pressure of gunpowder, attributes to it a far greater heat than would melt the metal of which guns are made, and the reason that it does not do so is that the heat acts on the metal for a very short time. We know that if a piece of iron is put in the fire for a short time, it will be but slightly heated, and if taken out can be handled without much difficulty, but if left in the furnace very long it will become melted.

Mr. Clinton Roosevelt.—I examined the fragments of the " Peacemaker," a very large gun that burst several years ago, the crystals in the metal were half an inch square, and they were afterwards worked over again and made very good metal.

Mr. N. Wiard.—The public imagine that we have some very large guns doing wonders at Charleston, but I know that there were only three 300 pounders sent down there, and I understand these have burst, and I may say that so far, the charges used in our heavy guns are very small.

The manufacture of tin-lined lead pipe, was selected as the subject for the next meeting.

Adjourned to Thursday evening, December 3d.

American Institute Polytechnic Association,
December 3, 1863.

S. D. Tillman, Esq., presiding; Mr. B. Garvey, Secretary.

New Slide Valve.

Mr. E. A. L. Roberts exhibited a model of his new slide valve, and said: It is somewhat difficult to explain without drawing, and I should much prefer to have a committee appointed to examine and report from a working model which I have in use. It is a small engine, three and a half inches in diameter and eight inches stroke, which does six times the work of a cylinder of the same capacity with the ordinary valve, and this engine works with greater regularity than any engine I have ever examined. I have seen the steam pressure vary from 20 to 60 pounds, and there could not be noticed more than two or three extra strokes. The valve is balanced, and the shaft that lifts the valve is adjustable by the governor.

On motion, this valve was referred to a committee consisting of Messrs. Bartlett, Rowell and Fisher.

New Repeating Gun.

Mr. Kellogg, of Hartford, presented a working model of his gun and said: The object in devising a gun of this kind was to produce an arm that would outreach the range of infantry, and the longest reach of any known firearm. The longest range we now have is from a half to five-eighths of a mile, and my gun will carry further than that. On account of the shower of balls that could be thrown at any desired point, I think it would not be difficult to stop a field battery from firing all day. It is worked by simply turning a lever back and forth. The cartridges are intended to be the same as those I have here, which are four and three-eighths inches long, and sixty-four hundredths in diameter. I have fired this 800 times as rapidly as I could, and only stopped when I found the barrel got so hot that I feared it would burst. The weight of the gun mounted on wheels will be about 300 pounds, and the balls will weigh, cartridges and all, about five ounces. There are two barrels which can be used alternately, so that one can be cooling while the other is being fired; but I may say that very rapid firing is seldom found necessary. The cartridges are metallic, and the fulminate is in the end, so that it requires no cap. The objection that I have heard to guns that fire rapidly, is that they waste ammunition, and that only a few shots can be effective, as after a volley the smoke obscures everything, and then firing is at random. This is no doubt true, but with my gun there need be no rapid firing any more than with the ordinary rifle, and we can wait until an object appears to fire at, and when necessary we can make this gun, with the aid of two men, equal to the firing of a whole regiment.

Mr. T. D. Stetson.—Why would you not make your guns of a larger size, that is increase the bore so as to make the shots more destructive?

Mr. Kellogg.—To do so would be only making what we now have. There are cannon now in use of one inch and one and a half inches in the bore. My gun is intended to take the place of light artillery.

Mr. Stetson.—The Union gun, made somewhat on this style, was a revolver mounted on wheels, and could be moved about like light artillery, and would throw balls of the common shape. There has been a number of them made—I should think about twenty altogether. This gun would throw twenty-four balls all at once.

Mr. N. Wiard.—This gun was called the coffee mill.

Mr. Stetson.—The cartridges for this gun were prepared in little steel cylinders, about three-eighths of an inch diameter, and these were carried along by the bushel. The gun seemed to fire as fast as the man could turn the crank; but in regard to loading, Mr. Kellogg's method is superior and much more simple.

Mr. Wiard.—The inventor of this gun just described, told me to-day that an objection to its firing so many balls at once was that the accuracy of the aim is destroyed. Twenty-four balls moving in parallel lines disturbs a large volume of air, and the tendency of which is to cause the balls to clog together, and thus impair the very important feature of precise firing.

Mr. Benjamin Garvey.—In examining a subject of this kind we should be guided by some practical results to be attained, and there are four to be considered in discussing the utility of this gun. The first is rapidity of firing; second, precision of aim; third, long range, and fourth, ease of handling. The different plans for rapid firing that have been devised, and have not come into general use, is a practical illustration of the failure of this feature. The only time when rapid firing would be necessary is in making a charge, and even in that case it has been found that firing a great number of shots is entirely useless. A British regiment in India, at one time, was ordered to charge up a hill, and when within 500 yards of the enemy they were ordered to fire, but what was their surprise when they found that their bullets tore up the ground before them, and their simultaneous firing was of no avail. We have an instance of an opposite nature at the battle of New Orleans, where a rifleman, with his slouched hat, stationed himself at a long distance off, and commenced firing deliberately; and when seen by the enemy he excited only their laughter and derision, but presently one man fell, then an officer, and still another, and soon their laughter was changed into sorrow; and after a short time all eyes were turned towards this one man in his rifle pit, whose single fire had produced so deadly an effect. In the first instance here spoken of, the simultaneous firing of a whole regiment may be said to be entirely wasted, while on the other hand we see the advantage of slow but accurate firing. What is wanted in small arms is precision of aim and long range. In the gun before us it is said we have the latter, but the former is doubtful, as there are many things that render it so. The simple working of the lever that fires the gun may disarrange the aim after it has been sighted. And in introducing anything new it should be made to conform as much as possible to the accustomed mode of working, for a gun made to suit a certain style of cartridges and no other, will be sure to fail of coming into general use. In the gun spoken of by Mr. Stetson it appears that the ordinary copper cartridge, in general use, can be fired from it, and these are fed into the barrel by their own gravity, and this seems to me to be an admirable plan; but as stated this evening, the firing of 24 balls at once is not an advantage. In vessels of war it is found desirable to fire heavy balls, and if a massive ball is fired once an hour it would be doing very well.

Mr. Stetson.—The principle on which this gun of Mr. Kellogg's works is very good and compares very favorably with others of the kind, though before giving an opinion we like to see what has actually been done in practice.

Mr. J. K. Fisher.—It appears to me that this mechanism can be worked with less leakage in the barrel than in most of the others that I have seen.

Mr. Alanson Nash.—If this gun will do the work of a thousand rifles, it is a very important instrument. As to accurate firing in battle, there is no such thing, for the confusion and excitement would not permit it.

Mr. Waterbury.—There is no doubt but that the copper cartridge will come into general use—all the new styles of firearms are adapted for it. The manufacturers of Colt's arms, I understand, are about to adapt their weapons to use them. Besides their facility in loading, they make an air-tight breech loader.

Mr. Kidder exhibited a new electro-magnetic machine, by which he claimed to produce six different currents, and it is so arranged as to have a uniform interruption in the current and works without any noise. Mr. Kidder set the machine in operation which was tried by some of the members, who said two different sensations could be felt.

The Chairman.—As magnetism will form the subject of a future meeting, it will be best to postpone any discussion on this matter till then as the miscellaneous business has occupied considerable time this evening.

By request, permission was given to Mr. Norman Wiard to read the following paper on

IRON-CLAD WAR VESSELS.

Mr. Chairman and gentlemen of the Polytechnic club: After the millions of dollars expended on iron clad fleets by France, England, and the United States, we have yet to learn of their success in a single instance that will compare favorably with even the ordinary achievements of our old wooden walls. During this war with the rebels, who have not even the shadow of a navy, we have had the Galena, the Monitor, the Keokuk, the Queen of the West, and other iron-clad ships destroyed, and the Merrimac and Atlanta have gone the same way. We have seen the Minnesota stand the shock of battle with an iron clad during which she received thirty-five heavy shells through her sides, but she was repaired in two days by her own carpenters; and we have had the Atlanta surrender after receiving five shots, not one of which penetrated her armor.

And this is about the whole story of iron-clads, unless we credit them with some *moral effect*, if the effect gained by boasting and lying can be called *moral.*

It may be said that the principal casualties to iron-clads have occurred by storms at sea or before earthworks, and that, under such circumstances, no ships are always successful. To this, I say, that the Burnside fleet, made up of North river barges, transformed into men-of-war in a few weeks and manned by landsmen, encountered the storm off Hatteras and the earthworks of Roanoke, successfully. Our wooden ships gallantly passed the sand batteries on the Mississippi below New Orleans, and were successful against earthworks at Port Royal.

A good iron-clad ship has never yet been made. I shall endeavor to specify the qualities necessary, giving precedence to the qualities in the order of their excellence.

1st. Means of offence as rams and with heavy projectiles, from guns giving precision, rapidity of firing, and high velocity.

2d. Means of defence; impenetrability to projectiles, to rams, or torpedoes, and protection to boilers and engines from injury in any manner.

3d. Speed to chase or to retreat.

4th. Facility of manœuvring, viz: to start back or come about quickly.

5th. Steadiness in sea way, with ability to use guns or ram in a moderate storm.

6th. Affording well-lighted and well-ventilated quarters for officers and men.

7th. Capacity for fuel and stores.

8th. Capacity for large crews of men and marines, so as to be able to make a formidable assault by boarding.

9th. Means of landing a formidable shore party for assault of works on shore.

10th. Simplicity and cheapness, that they may be produced rapidly and at low cost.

Great efforts have been made by interested parties to create a public opinion that our Monitor iron-clads excel in all these qualities, or that they are nearly perfect in them, by unceasing praises of them and of their projector, in newspapers and magazines, and through the eloquence of unscientific politicians and sanguine, self-constituted semi-scientific men, on the stump, in the pulpit, and before learned societies, until an iron-clad mania has taken possession of us as a people, with so much method in it that we have assured ourselves, confounded the rebels, and made European nations doubt and hesitate—the grandest result of boasting, I believe, ever attained; but the advantage is but temporary and will soon recoil upon us.

Had the first Monitor gone down on her way to Fortress Monroe, and had the Minnesota been commanded by the brave John Worden, instead of being run aground in the cowardly manner that she was, she would have laid alongside the unwieldy Merrimac, and with her tremendous broadsides from depressed guns, have smashed her frail casemates before she could have returned as many shots as she planted between her decks as she lay ingloriously aground. The Minnésota would have captured the Merrimac in ten minutes if at close quarters, or could have easily run her down if she had failed to do so in that time.

The first Monitor failed in an important point, when she made but five and a half miles an hour, she being new and her bottom not foul.

She proved to be utterly unseaworthy on her first trip to Fortress Monroe.

Her crew were nearly suffocated during the same trip, and again during her encounter with the Merrimac.

She required a tender to go to sea at all.

Not one of her class of gunboats yet made is much better in these qualities. When she fought the Merrimac, her battery proved insignificant; two guns is a small armament for a ship that costs, equipped, one and a half millions of dollars. All of her class are equally inefficient in this respect, or are worse in the heavy fifteen inch guns that give a velocity of 650 feet per second and a greater range, except by the ricochet of 500 yards.

If any iron-clad frigate, with two tiers of heavy guns, say 68-pounders, or 11-inch, were alongside a Monitor, she could sink her in *one minute.* She could depress her guns and fire through deck and bottom at every shot from every gun on the contact side. She would be sunk so quickly, being but a few inches above the water, that the crew could not be rescued through her iron hatches, bolted down as they are in action.

When the Monitor was in the James River, before Fort Darling—a fort on an elevated bluff of a narrow river—she exhibited another weakness. She could not elevate her guns to reach half way up the bluff. She was helpless for assault and had to retire. The guns of the fort also could assail her on her most vulnerable point. No improvement has been added to any of her class to meet such important emergencies. Let us suppose a Monitor stationed at the junction of two narrow rivers with high bluffs on either side, on blockade duty. If the current were five miles an hour, she would have to anchor. (The time to be July, the place Virginia.) Then suppose a squad of guerillas, with target rifles determined to break the blockade, should come at night to the brink of the bluff, and each dig a rifle pit behind the stump of a tree. The first officer or man who should put his head above the hatches in the morning, for fresh air, would be shot, and the formidable iron clad would be unable to repel or resent the insult. She could not elevate her guns to reach the assailants, and her crew would find confinement below decks in the heated foul air, unendurable, while to come on deck would be certain death. The blockade would have to be raised; it would be only a question of time. None of the Monitors can fight head or stern, as its concussion through the chimney and air openings affects the men below seriously, when guns are fired over the decks forward and aft. Five small rams, no larger than some of our harbor tugs, having powerful engines and boilers well below the water line, with stems like the Dunderberg, made solid one-third their length with timber and with iron, shot proof pilot house, could destroy the whole fleet of Monitors, whether in harbor or at sea, in spite of their utmost efforts, if the whole five should assail one at a time in succession. But five minutes would be required for each Monitor, if the assault was well managed.

Ten such rams could be constructed and fitted for service for ten per cent. of the cost of one Monitor, and in a tithe of the time in which a Monitor could be built.

With the facilities for ship-building possessed by New York harbor, I had rather, as a commercial transaction, take a contract to build the fleet of rams to destroy the whole iron clad navy, in spite of their utmost efforts, than to build one Monitor.

And what have we in Charleston harbor to-day for our expenditure of $40,000,000? An iron-clad navy carrying less than forty guns, and these guns capable of projecting only four shots an hour, each; the ships obliged to anchor when in action before the enemy's batteries, that the tide may not sweep them into the enemy's harbor, on their torpedoes, or prematurely ashore.

The iron-clad Galena has not been heard from since her maiden effort on the James River. If her ventilation was not good when she went into action, it was so when she came out. The Keokuk had a short, but brilliant career. The Roanoke is said to be top-heavy, and therefore unfit for sea, and she draws so much water that she can enter but few of our harbors. The Ironsides has no speed, and cannot be steered, and she completes the list of failures. Our wooden ships-of-war are notoriously slow, yet we must remember with pride their capture of New Orleans, where the conflict was with formidable earth works, and of Port Royal, where the gallant Dupont formed his fleet into a crescent battery, and gave a salute from a new position each time he circled around, as it were, in a triumphant procession, which, if attempted by our iron-clad fleet, would more resemble a funeral procession, from its minute guns—a contrast that must have occurred promptly to the gallant Admiral, when he was condemned to the command of the iron-clad fleet in Charleston harbor, where he was unable to take advantage of another wonderful creation of the great Ericsson, the Devil, because the Monitors, so far from being able to shove so heavy a drag before them, were unable even to make headway against the tide,

If the qualities enumerated at the beginning of this argument are really essential to efficiency in iron-clad ships, how sad it is to reflect that not one of our boasted fleet comes up to the requirement in a single particular.

THE MANUFACTURE OF TIN-LINED LEAD PIPE.

The subject for the evening was here taken up, when Messrs. Willard and Shaw, of the New York Lead Company, 63 and 65 Centre st., exhibited a large drawing of their method of making patent tin-lined lead pipe. Mr. Shaw said—We make this pipe in lengths of fifty to sixty feet with one charge, but, if necessary, we could make it a mile long. The lining is of pure tin without any alloy. The tin unites perfectly with the lead pipe. This tin-lined lead pipe can be worked as readily as the common pipe, and is as cheap as it, when we take into account its extra strength which enables us to make the pipe a little thinner and brings the cost down to the lead pipe, as it is by the weight the pipe is sold. We make a uniform coating of tin inside the pipe and all parts will have the same percentage of tin throughout. We claim the formation of a tin and lead pipe at the same operation. Block-tin pipe is objectionable on account of the difficulty the plumbers have in soldering it. When making the pipe the tin and lead are very near the melting point and when forced through the press unite perfectly.

Mr. Nash.—In regard to the deleterious effect of using lead pipe I can say that if I let the water stand in the lead pipe in my house for an hour I can instantly perceive the taste of the lead in the water, and I now never use the water without first letting it run till I know it comes from the iron pipe in the street.

Chairman.—This question of the effects of lead pipe on the water passing through it is a most important one. It has been decided by some chemists that there is no injurious effects from its use, as the water unites with the lead forming a thin coating of the carbonate of lead, which is insoluble in water. While on the other hand we have a number of opinions quite the contrary. It is a subject we should discuss more fully than time would allow this evening; I would, therefore, suggest that it be continued as the subject for the next meeting.

Mr. Thomas Godwin made diagrams on the black board showing Lowber and Leroy's method of making tin-lined pipe, and also Mr. Ewbank's mode of tinning lead pipe, which was simply a shallow ladle filled with melted tin, and a little rosin being placed in the opening of the pipe to be tinned, it was drawn though the melted tin and coated it but not perfectly, as Mr. Godwin said he had stripped many feet of the tin at a time, and this was also the case with Lowber and Leroy's system.

Mr. Lang made a drawing of Lowber and Leroy's method of lining lead pipe; he said he had worked at it for seven years, and that they did not use pure tin but an alloy of tin and lead, as pure tin melts at a higher temperature than the alloy; by their process the lead pipe would be melted by using pure tin.

Mr. Garvey.—There can be no doubt but that we have here a very beautiful and simple process for coating lead pipe with tin, not like the other processes described here which may tin in some places and not in others, but what is most needed would appear to be the exact temperature which is necessary in order to effect a perfect union of the two metals. The specimens of tin-lined pipe which we have here are the most perfect pieces of workmanship which I have ever seen of the kind.

The subject of conveying water through lead pipe was continued for the next meeting. Adjourned.

American Institute Polytechnic Association,
December 10, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

Gold Mines.

Dr. R. P. Stevens.—Mr. Chairman, one of the most important discoveries within the last six months has been made in the exploration of the gold fields on this side of the Atlantic, which, from present appearances, will rival that of California. It has long been known that on this part of the continent of America, gold has been found in the streams running through East Canada, but the reports of Canadian geologists have been so favorable that companies were formed in this city and other places to work them, and parties have been sent there expecting to find the gold in even greater quantities than represented. However, within the last year, gold has been found in St. Francis and in several other counties, and the indications are that it can be had in reliable quantities all over the country. There is no one local supply which is peculiar to one place, but very extensive deposits are found from lake Champlain to the bay of New England. The surface of these deposits forms some of the most beautiful country on the American continent, abounding in charming scenery. There are some incidents connected with these surveys which resulted in the discovery of this gold, that may be alluded to, for instance: Our city fathers, in 1810, decided to build the old city hall, and they appointed a committee to select the proper building material, and the result was that they sent all the way to New Hampshire for it, when in this very State they had a far better material. Another case is that of a farmer who was in great distress on account of a heavy mortgage on his farm, and in order to raise means to pay it he determined to go to California and work in the mines until he could make enough to redeem his farm, but he left more gold behind him on his farm than there was on his working claim in California. I have seen $20 taken from this farm in one day, and this is not an unusual amount. Some persons have thought that this gold must have come from some quartz vein. There may be such, but I have never been able to see any indications of quartz. So far as I have been able to understand the theory of gold deposits, it is found more frequently in the quartz vein than in any other kind of rock. Occasionally gold is found in several kinds of slate, and at times in tertiary rocks. I am not disposed to limit the precise locality to any one, two, three, or four kinds of rock, but it may at times pay better in a certain kind of rock. Why it is found more in the quartz rock can readily be explained by the chemical theory. In the quartz, there is always associated with the gold, sulphur and iron. This sulphur and iron has the gold in combination, and the sulphur in the quartz, when decomposed, leaves the iron and goes by itself. The result of this decomposition is what is called red quartz, and red quartz is understood to be an indication of gold. The gold of California, as examined by Dr. Trask, is found in three distinct formations; the last is in a series of veins running north and south. This system of veins can be traced from Cape Horn to the Indies, and from the British Possessions to the North Pole. Everywhere they are very rich in gold. Then there is another system which crosses this, running nearly southeast and southwest. This system is later in its origin than the others, because it crosses over them. The series running northeast and northwest contains various metals, and occasionally pure copper, and ultimately all gold veins in California will bear copper.

We now come to another point, as at times we are asked some very stumbling questions, and in self-defence we are obliged to concoct some theory in reply to them; and here I may say it is pure theory. One of the questions which has puzzled the geologist very much is this: Where does this gold come from originally? This question throws the scientific man on his beam end. It will not do to say he does not know, for that would tend greatly to destroy his other opinions and he will be regarded as of no account; so we have to invent theories, pure theories. Some say it comes up from the bottom of the ocean. This would lead us to infer that if we find a vein of gold on the surface that pays a certain rate per day, and if we should go down some two, three, or six hundred feet, we would find gold that would pay still better—and this is the upshot of the whole theory. I suppose as much money has been sunk in this country upon this false theory as upon any other. All we can say is that after going from one series of rock to another we come to one that has gold; then we come along still later and again we find another system of rocks that has pure gold; after which we come to a series of rocks that are termed tertiary, which compose most of the crust of this globe. Bischoff supposes that it was formed from water. Certainly the ocean contains an immense amount of silver in solution. The Germans have originated the idea that the sea is the mother of all our minerals—but how did these minerals come in the ocean? They must have been dissolved in their substance. And now, Mr. Chairman and gentlemen, I have studied this subject for thirty years, and I must say I know as much now as when I commenced. I do not think the time has come for us to know it. It is well enough to ask the question, but the time has not yet arrived for us to answer it—but I do believe the time is coming. Perhaps the child is now born who, being gifted with that high and noble intellect required for the task, will be able to grasp the entire solar system and trace it step by step from its gaseous state, to the time when the heavenly bodies were formed, and follow them through all their vast changes up to where they are to-day.

New Rifle Ball.

Mr. Waterbury exhibited his new rifle ball made of iron with a circular piece of leather at the back. He said: One of the difficulties of the Springfield rifle is the fouling of the piece, from the lead of the ball sticking in the grooves, so that, after being fired a certain number of times, it has to be cleaned. At one time the English used a wooden plug at the end of the ball, but it was found that the wood flew to pieces immediately after leaving the gun. In this country the minie ball made hollow at the end, is in general use. This hollow part, on the powder expanding, is forced into the grooves; a portion of the lead is left behind at each fire which eventually fouls the gun, so that, after firing the gun sometime, it is very difficult to force the ball down the muzzle. I claim that a ball which does not enter the grooves will obviate all this. I accomplish this by using a leather washer at the end of the ball, and I find that the oil in the leather cleans the gun, and the oftener it is fired the cleaner it gets, as the ball does not enter the rifling of the gun. Here are two balls, one of lead and the other of iron, the iron one I have fired 1,000 times in a room 100 feet deep, and it is not perceptibly altered yet. The iron balls are prevented from rusting by dipping them in zinc. The rifling movement is given to the ball by the leather being forced against the ball and expanded into the grooves, which turns the ball with it. I have fired this ball through an inch of wood and found the leather half way through the wood. By this plan I believe we get a gas tight ball. In the leaden balls that are used on the minie principle, the lead is forced into the rifling at the expense of the force of the powder, and thus diminishing its effects materially; so much so that I have got one-third greater penetration with my ball than with the minie; and as there is more power, I consequently get a greater range.

Mr. Benjamin Garvey.—We should be very cautious before admitting anything to be a fact, that it should be well established by repeated and careful experiments; and we should not place it in the category of facts, until after receiving the approbation of the majority of the men of science. For after all a fact may be only a mistake. However we have the facts well established that the specific gravity of iron is not equal in every part; that the portion which cools first will be most dense, and consequently heavier. And this, together with the different qualities of the iron itself, will cause a ball to vary in its course, and mar its accuracy. The supposition is that in iron we get a perfect metal throughout, but this is not so, we can never get a mass of matter homogeneous; so after much generalization it was concluded that a revolving motion given to the ball would obviate this unequal gravity or crystalization of the iron. With regard to a ball turning and pointing its lightest end forward it is found to be true, but only so in small arms, which the rifling motion now given to the ball may be said to remedy, the ball being made to rotate on its axis is constantly changing its specific gravity, by which the ball is kept in the line that it received from the barrel of the gun.

Mr. T. D. Stetson.—With regard to the form of balls it is a little singular that the first balls we know of were long. The Arabians had guns that fired arrows of iron, and some that used other materials ; and simple as it now appears, the man who conceived the idea of making balls round accomplished a wonderful thing in his day It was a tremendous invention, it could roll in the gun, and in the air, or on the ground. The first rifling we know of was in straight grooves, and this was to allow leakage, and is now adopted to a certain extent in firing shells, which leaves a place for the gas to ignite the fuse. It was found that by using spiral grooves, a ball would rotate on its shortest axis, and the end which would strike first could be known precisely, so the rifling makes a gun nearly perfect. The minie ball is the result of a long list of experiments. The rear end being made hollow, when fired swells and fits into the grooves, and on this account, the ball must be made a trifle smaller, in order to let it go into the barrel. In the minie ball the powder spreads the hollow centre of the rear end into the grooves, which brings the ball coincident with the bore of the gun. Balls that use a sabo in the rear, to fill the grooves, have not thus far acted well, as the sabo flies off from the ball as soon as it leaves the muzzle, and therefore there is very little rifling motion given to the ball, and the tendency will be to go outside of the line desired. The minie ball being in one piece makes it preferable, but it has this drawback, the thin sharp edges of the hollow rear end at times fly off ragged, which leaves one side rough and lighter than the other, and tends to destroy its accuracy. At the present time we want long range and accuracy ; and this is the reason why rifles are used in the government service. We want them to reach half a mile instead of the old 200 yards. Compound balls have failed to meet the favorable attention of government officers. But the idea of using a sabo at the back of the ball is quite old. At present there is nothing so well established in the government service as the minie ball for rifles. There is what is called the Shankle projectile, a ball with a papier mache sabo ; this has some very good qualities, but there is one objection to it, and that is, the thickness of the paper or the swelling of it with the hygrometric changes of the atmosphere. On this account the paper has to be made very thin, but in a dry atmosphere the paper contracts and fits the bore of the gun very loosely, and consequently there is a leakage of the gases from the powder, but this style of ball is now going out of use. It is generally believed that lead is better than iron for balls, because it is denser ; but why not use it in cannon ? This cannot well be done, for if we fire a leaden ball of large size, it will squash or act like so much putty.

There have been some instances where lead balls have been fired from four and five inch guns, but they were not *balls* when they were picked up.

Dr. J. B. Rich.—At the siege of Antwerp, they poured lead into shells in order to make them reach the city.

On motion, Messrs. Stetson, Garvey and Nash, were appointed as a committee to examine Mr. Waterbury's rifle iron ball.

Professor Everett, chairman of the committee on tin-lined lead pipes, said the committee were pursuing their investigations, and would not be able to report at this meeting. The subject of conveying water through lead pipes and lead pipes lined with tin, was one of great importance to the community at large, and the committee hope to have the time to give it due attention. I have here several specimens of what is termed tin-foil, but which is composed of a sheet of lead between two sheets of tin rolled out to a very extreme fineness, it is used for wrapping sundry articles, particularly tobacco. In regard to the use of lead pipe I am informed that in Boston it is very unusual to employ it for conveying water. The builders use either iron pipe lined with glass, or the pure tin pipe.

Mr. Overton.—A friend and neighbor of mine in the country uses water that comes through a lead pipe over half a mile long, and I have never heard any complaints from him of its injurious effects.

Dr. Percy.—The injurious effects of using lead pipe for conveying water can be proved by numerous instances of persons who have been poisoned, and eventually have died from using water coming through lead pipes. I have in my house lead pipe that has been in use some twelve years, and if I take a piece of wood and strike it, and then draw the water from it I will immediately detect the lead in it. Some years ago, when I was with Prof. Torrey, it was the custom to draw the water into a tank for the use of his laboratory, and one day the water was found to contain some sulphur. This lead to the analyzation of the water, and it was ascertained to have lead always in it. I have found that it was produced by the erosion of the metal. I have collected a grain of lead to a pint of water, where it has been standing for a single night. I have seen places in this city, where the water would not run up to the third and fourth stories in the day time on account of their height, but would run in the evening, and when turned on at night this water would always have the sweet metallic taste of lead.

The bursting of guns was selected as the subject for the next discussion.

Adjourned.

American Institute Polytechnic Association,
December 17*th*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

During the hour devoted to miscellaneous business, the Chairman read a very interesting paper, giving a summary of scientific news.

A New Metal—Indium.

A new metal has been discovered by Messrs. Rich and Ritter, in a mineral composed chiefly of sulphur, arsenic, iron and lead. The new metal is distinguished in the spectroscope by an indigo ray, and has received the name of Indium.

OZONE.

According to the views of M. J. L. Soret, before the French Academy, ozone has a different composition from that ascribed to it by M. Schonbien, and the leading scientists. It is conceded to be an allotropic condition of oxygen. The ozonized atom expressed by prefixing the plus sign to the symbol and the deozonized atom, by the minus sign, were supposed to form a molecule of ordinary oxygen.

M. Soret states that when a platinum spiral is passed up into a vessel containing ozonized oxygen, and brought to a dull, red heat, there is a great increase of the volume of the gas, while a similar application of the platinum coil in ordinary oxygen shows only a slight increase.

This fact, with others stated by him, induced the belief that the molecule of oxygen consists of three or more atoms.

GUN COTTON.

A report made to the British Association by Mr. Scott Russell, asserts that gun-cotton is, in many respects, superior to gun-powder. The quickness and intensity of its explosion is regulated by the extent of space which a given mass of cotton occupies.

PETROLEUM.

American petroleum has been studied recently by Pelouze and Cahours, who, according to the *Comptes Rendus*, find that it contains homologues of marsh gas—the lowest term of the series being hyduret of butyl, boiling at about thirty-three degrees Fahrenheit; the highest series thus far obtained being C_{30}, H_{32}. It will be noticed that in this series hydrogen is always in the excess. It has generally been supposed that as carbon predominates in petroleum, whether crude or refined, the products of decomposition would have the same characteristics.

Bromides of magnesia have been found in considerable quantity in the water of the Dead sea, according to the analyses of M. Roux, presented to the French Academy. This gentleman suggests that these waters may be valuable as a medicine for scrofula and similar affections.

NEW ASTEROID.

The new planet discovered some months since by Mr. James Watson, of Ann Arbor, Mich., was seen by Oppolzen, in Vienna, on the 6th of October last. This planet is one of the asteroids of which upwards of fifty have been discovered.

The law of sexes among cattle, as promulgated by Prof. Thury, of Geneva, Switzerland, depending upon the degree of maturation of the ovum, has lately been confirmed by the successfully predetermining the sex in every case where his directions were followed.

Dr. J. B. Rich.—Some very curious facts came under my observation during a series of experiments upon animals, in regard to impregnation, when it was found that it was not necessary for animals to be in what is termed the rutting season in order to the desired results. In one case, where a horse was experimented upon, there was an entire absence of the usual signs attending the rutting season, and yet impregnation followed by the first connection. The same experiments were tried on cattle, hogs, &c., and the result was the same. It was also found, as far as my observation went, that the male first predominated in the offspring. It was accident that first brought these facts to the attention of those connected with horses, after which these experiments were tried.

SOLAR RAYS.

Volpicelli states in the *Cosmos* that he caused solar rays to traverse an oxy-hydrogen flame, the primitive atmosphere being dry, without augmenting in number or intensity of the telluric rays in the spectrum, and, therefore, he concludes these rays are not caused by the vapor of water.

STEAM BOILERS.

Mr. J. K. Fisher, as chairman of the committee to whom was referred the subject of steam boilers, which are claimed to be nearly harmless in case of bursting, with a view to their adoption on passenger vessels, reports that in their opinion there are several worthy of trial, two of which they will name. The first in merit is that patented by Dance & Field. It is a modification of the boiler of Goldsworthy Gurney. It was tried on a steam-carriage in 1833. Gordon, in his *Elemental Locomotion*, says it appeared not to make dry steam. But this probably was a fault of proportion. The largest number was but two inches in diameter—a size now known to be too small to separate the steam from the water. Had the principal tubes been four or five inches, it is likely that the steam would have been dry, and the power contained in each part would still have been incapable of doing much harm. The plan consists of a group of boilers, perhaps a hundred, each consisting of an upright two-inch tube about three feet high, from which there is a return bend about three feet long of one-inch tubing. These boilers are so arranged that the return bends interlock, and form the fire-grate and fire-box roof, and the uprights form the sides of the fire-box. Other uprights, without bends, form the front and back of the fire-box. The pipes which connect these boilers to the main steam and water pipes have orifices so small that, if a rupture occurs in one, the power in that one is all that is instantly set free; and the power from the others blows through two small holes, which act as safety valves, and slowly liberate the power from the other parts. If the connections be properly proportioned, the steam would not blow open the furnace door and throw out fire, as was done in the *Isaac Newton*, but would escape up the chimney as fast as it issued from the boiler.

The second plan is that of Mr. Francis Maceroni. It is said to have worked efficiently, and made dry steam on his steam-carriage. But from the great extent of heating surface, and the speed of the carriage—although great—it is doubtful whether it made steam as rapidly as boilers invented since that time. It consisted of eighty-one boilers, each four inches diameter and three feet high, connected by small pipes to a steam-drum. The outer rows are four feet long, the lower ends forming the walls of the fire-box. The rest are placed vertically over the fire, the flame ascending between them. It appears that the flame ascending between upright tubes does not act so effectively as flame ascending within the tubes of the com mon upright boiler, which has come into use since Maceroni's experiments; but when the flame is driven horizontally among upright tubes, as in the water-tube boilers of Montgomery, Martin and others, it is fully as effective as in flue-tube boilers. This direction of the flame may be give in Maceroni's boiler; and with this modification it would probably make steam as rapidly as any boiler of equal surface, when the best proportions have been found by trial.

Either this boiler, or that of Ogle & Summers—which differs from it chiefly in having a flue through each tube—is the original of the water-tube boilers now in general use in our navy. Earl Dundonald adopted Ogle's boiler, deeming it the best for marine service; but probably on account of the difficulty of keeping it clean, he changed the plan and produced what is called the Dundonald boiler; in ships the tubes open into chambers large enough to admit men to clean them. This was an abandonment of the principle of safety, which consists in avoiding large chambers; an abandonment to which Earl Dundonald was probably constrained by the want of a surface condenser, a want now so well supplied that many vessels have used them for years without repair and with advantage. The Dundonald boiler sent its smoke downward among the tubes; but its movement was slow and mainly parallel with the tubes.

The next step toward the present favorite boiler was made by Mr. James Montgomery. He sent the smoke swiftly across the upper half of the tubes, and returned it, under a diaphragm, swiftly across the lower half of the tubes. The swift motion of the hot gases heated the tubes effectively, as the swift motion of cool air cools a body more efficiently than air of the same temperature that moves slowly.

The boiler as modified by Mr. D. B. Martin is free from the engineering objections that obviously hold against the original of Maceroni or Ogle. Its tubes are so short that they can be taken out for repair, and can be cleaned. But this is because there is room for men to work in; and this room, when the boiler is at work, holds power enough to rend a ship in pieces. Thus we have another objection on the score of humanity, which is the greater objection we are called upon to determine with a view to practical improvement, if we determine that the inferiority, in an engineering sense, of the small-chambered boiler is not so great as to outweigh the consideration of safety.

On this all-important point the committee can at this time only give an opinion, or rather impression, that arises from a general view of the progress of steam engineering. All the engines and boilers now successfully in use have become what they are by a long course of practice and improvement. They have had break-downs, partial failures and small economy in their beginning. So, it may be expected, will it be with new plans—plans old in point of time, but new in respect to practice. They may be troublesome for many years, yet, after as much exercise upon them of talent and capital as have been lavished on the plans now in the ascendant, they may be as cheap and convenient. It is the opinion of many of the most celebrated engineers in the world that these boilers, when their proportions and details are worked out, will be lighter, less bulky and cheaper than the present boilers; and your committee have a faith, which they deem accordant with reason, that in the end it will appear that nature has not made the safety of life and the profit of carriers absolutely incompatible.

The committee have deemed it proper to make this report, not as a complete fulfillment of the duty assigned to them, but rather as a means of attracting the attention of those who may know of other plans that merit consideration, and may be inclined to promote the general object of this inquiry, which is not the advantage of particular individuals or trades, but the proof of whatever merit there may be in the boilers, whose peculiar characteristic is that even in case of rupture they have not power to destroy a vessel or otherwise endanger life. The committee are convinced that there are some such boilers, and that it is the duty of liberal friends of science to aid in giving them a public trial. There may be others of which they are ignorant, if so, they wish to be informed of them, and take this occasion to ask for information.

T. K. FISHER,
B GARVEY,
W. ROWELL,
Committee.

Mr. Fisher spoke at great length upon the subject, and thought that we had had a sufficient number of accidents to life and property, resulting solely by the use of unsafe boilers, and it was time that the general public insisted upon a better class of boilers being used, and that those acting in the capacity of common carriers should protect the lives of those they carry, and if a proper boiler was more expensive in making steam, then the remuneration should be in accordance.

Mr. T. Godwin presented specimens of pure tin pipe, which he desired to have referred to a committee. On motion of Mr. Stetson, the matter was referred to Messrs. Stetson, Garvey and Dawson, to report upon.

The subject for the evening was here taken up.

BURSTING OF GUNS.

Mr. T. D. Stetson.—If we take a sheet of glass and fire a pistol or musket ball through it, we punch a hole of about the size of the ball; but if we fire very slow by using a small charge of powder, we break the glass to pieces; in each case we have a different effect produced, and also a different measure of force. Mr. Norman Wiard, of this city, who has had large experience and great practical knowledge on the subject of guns and the force of gunpowder, has arrived at an original way of testing the force of gunpowder, which will materially alter the calculations of others who have so far experimented on the subject, and from which Mr. Wiard concludes that force of gunpowder in a cannon is from 10,000 to 12,000 pounds on the square inch, and this he considers is the maximum pressure.

To test this, take an 11-inch gun and load it with thirty pounds of powder and solid shot—bring the muzzle close to the target where the velocity is greatest, and then fire it against a plate of iron four and a half inches thick, which is the orthodox thickness for target practice, and we will find that the ball will break through this four and a half inches of iron; and this is about the measure of what an 11-inch gun will do. Now if we measure the force applied to punch a hole of the same area as that made by the cannon ball, we can nearly determine the pressure it takes to shear off metal for a given area and thickness. Mr. Wiard, by this process, approximates to the force of powder which he assumes the maximum force to be 11,000 and some odd pounds. How this pressure is distributed through the length of the gun, we have as yet no knowledge. Captain Rodman has made an apparatus to find this out, but the principle on which it is constructed would lead us to doubt his conclusions.

Mr. Norman Wiard.—The experiments made at the Springfield armory showed that gun barrels were not permanently enlarged by gunpowder, but that they were by water at a pressure of 5,000 on the square inch. From this fact it appears to me that the pressure of gunpowder must be even less than this.

The great problem to be solved is to find out the actual pressure of gunpowder. The great diversity of opinion is really astonishing. It is calculated by some to be 100,000—by others 200,000, while some authors calculate it at 750,000 pounds on the square inch. Now, if a pressure of 10,000 pounds on the square inch will punch a hole through iron, would not five times that pressure blow a gun all to pieces? And I will not ask what would be the effect of 750,000 pounds pressure. Now, what bursts a gun? The theory by which I explain it is, that it is due to the unequal expansion of the metal from the heat of the powder, and I have not as yet found any one to controvert it.

In making guns for the Ordnance Department, they insist that the tensile strain of the iron shall not be above 28,000 pounds, and they would be rejected if above that. I make metal of 38,000 pounds tensile strain, but am not allowed to use it. The conclusion is, that guns of a lower strength, of even 16,000 pounds to the square inch, have stood the best. A 10-inch gun, one of the best I made, which had a tensile strain of 38,000 pounds, burst on the fourth round. It is a remarkable fact that cast-steel guns will burst when cast-iron ones will not so readily, and that guns made of metal of a tensile strain of 16,000 pounds on the square inch, will stand the best. The 500-pounders at Charleston which threw a shot five miles, burst after a few rounds, as did also the 200 and 100-pounders, and Gen. Gilmore is now using 30 and 50-pounders.

Mr. Benjamin Garvey made several diagrams on the black-board illustrating the mathematical principles involved in using projectiles with high and low velocities. He said there was one point which he had never seen taken into account by those measuring the force of gunpowder, and that was, that at the moment the powder is ignited, the force is so great that the back section of the ball, particularly in rifle shots, is bulged or swelled up at that end, and causes increased friction, which diminishes much force of the powder.

"The Use of Lead Pipe," and "Magnetism and Electricity," were selected as the subjects for the next discussion.

Adjourned.

American Institute Polytechnic Association,
December 24*th*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

The Chairman commenced the miscellaneous business by reading the following interesting summary of the latest scientific news:

Salts of Thallium Poisonous.

The new metal, thallium, is found to be more poisonous than lead. The carbonate and sulphate thallium have been given, with fatal effects, to fowls, dogs and rabbits.

Corn from Buried Pompeii.

M. DeLuca has analysed some unground corn found in a bakery, recently opened in Pompeii. The grains had, for 1,800 years, kept their original form, but were of a brownish-black color; they retained the nitrogen and nearly all the carbon usually found in corn, but all traces of starch, gluten, sugar and fatty matter were lost.

Anti-adipose.

Bromide of ammonia, according to the report of Dr. C. D. Gibb, taken in very small doses for a long time, acts with greater certainty than any other known substance in causing an absorption of fat and diminishing the weight of the human body.

Why the Stomach is not Digested.

The old answer to the question, why the secretions of the stomach do not act upon the inner coats, was the resisting power of "the living principle;" but since vital force has been admitted to be the result of forces constantly generated in conformity to natural laws, a more direct cause for the protection of the stomach itself is demanded. The resisting power does not exist in the epithelial lining, for where a portion of the mucous membrane has been removed, food will afterward be digested without the slightest sign of attack being made upon the inner coats of the stomach. Dr. Davy refers the immunity observed to the circulation of an alkaline current of blood within the walls of the organ, the effect of which is to destroy the solvent properties of the digestive fluid by neutralizing its acidity.

Salts in Rain Water.

In a memoir to the French Academy of Science on rain water, Mr. Robinet states that he has made 118 observations during the last year and a half on the water falling in Paris.

He found the water more or less charged with saline matter, principally sulphate of lime, which decreased in quantity as the rain continued. Nitrate of silver dissolved in it, gave, in time, various shades of red, and formed a reddish deposit which contained silver. The exact nature of the substance which produced the phenomena of coloration is unknown.

Chemical Action of the Sun's Rays.

Dr. Phipson has observed that a solution of sulphate of molybdic acid or molybdic ammonia, with excess of sulphuric acid, when exposed to the sun's rays for several hours becomes of a bluish green, and at night is again colorless. He supposes an atom of oxygen leaves the molybdic acid and forms oxygenated water, which is again freed at night and passes to the acid; and he proposes to use this substance for the purpose of measuring the force of the actinic rays. This substance is not as sensitive as several others, and a method of using it expeditiously is not so easily devised as the doctor supposes.

ANÆSTHETIC.

The Nitrate of amyle, according to Dr. B. W. Richardson, when inhaled, acts more powerfully than any other known agent in increasing the action of the heart. Its effect upon the lower animals is remarkable; in frogs animation could be suspended for nine days, with perfect after-recovery.

RECIPROCAL ACTION BETWEEN PLANTS AND GASES.

The question how plants are affected by the contaminations of the atmosphere, is becoming a serious one in some of the manufacturing districts of Great Britain. In the coal and mining localities the air is tainted chiefly with sulphurous and hydrochloric acids and ammonia. According to the experiments of Mr. R. Garner, reported to the British Association, on plants by means of gases applied to both the leaves and roots, it appears that annuals suffer less than evergreens. Some plants which luxuriate on the coal strata, such as the oak, the holly, and some ferns, died soon after the mines began to be worked. It was fortunate, however, for the agriculturist, that wheat and corn flourish, when nothing else could, in such districts.

ALUMINIUM BRONZE.

The manufacture of this alloy, having the beauty of gold and the strength of iron, has become of great importance. The French now obtain the alumina from a mineral called bauxite, containing 57 per cent. of alumina, 25 of oxide of iron, a small portion of titanium and silica, a trace of carbonate of lime, and 11 per cent of water.

PRESERVATION OF STONE.

M. Kuhlman has continued his researches on the preservation of materials for building and ornamentation, and has presented to the French Academy an account of his experiments on the action of different gases on colored stones, at elevated temperatures, but not so high as to effect any decomposition of the materials. The stones were exposed to a current of gas in a porcelain tube. The following results were obtained :

Oxygen decolorized marbles colored with bituminous matters. Agates and green and yellow jasper turned brown or bright red. Smoky quartz, amethyst and topaz were decolorized, but preserved their transparency. Emeralds and sapphires turned pale; carnelians were decolorized and slightly decomposed; binoxide of nitrogen and chlorine behaved nearly the same as oxygen.

Hydrogen turned all the stones colored with metallic compounds black by reducing the metals. *Ammonia* also reduced the metals. *Cyanogen* acted energetically as a deoxidizer.

Sulphuretted Hydrogen did not affect colored diamonds and sapphires, but turned rubies violet. Rose quartz and amethyst were decolorized, but remained transparent. Turquoise was blackened, as were marbles, agates and granites, colored with the oxide of iron.

The Chairman added, as the chemical constituents of the minerals experimented upon may not be remembered by all present, it may be interesting to briefly state them.

Marbles are limestone, more or less pure, that is carbonate of lime, consisting of one equivalent of calcium, one of carbon, and three of oxygen; or, in other words, of lime and carbonic acid.

Verde Antique, a clouded green marble, consists of a mixture of limestone and serpentine; the latter is composed of nearly equal parts of silica and magnesia, with water and a trace of the oxyd of iron.

Quartz is pure silica, according to Berzelius, $Si\ O_2$, but the later chemists regard it as consisting of $Si\ O_3$.

Amethyst, Carnelian, (commonly called Cornelian,) agate, jasper and opal, are varieties of quartz.

Diamond is pure carbon in an allotropic state differing from charcoal, mineral coal and plumbago.

Sapphire is pure alumina, $Al_2\ O_3$. Some varieties of these crystals rank in value next to the diamond. Dingy clouded crystals of pure alumina, are called corundum. Emery is a granulated bluish gray or black variety.

Topaz is composed of alumina, silica, and fluorine. Emerald is a variety of beryl which consists chiefly of silica, alumina and glucina. Emerald owes its rich green color to the presence of about one per cent of the oxyd of chromium.

Ruby is a variety of spinel, essentially alumina and magnesia. Garnet is a combination of silicates of alumina, lime, iron and manganese.

Turquoise is composed of alumina, phosphoric acid and water, with a small quantity of the oxyd of copper and iron.

Granite is composed of feldspar, quartz and mica, and generally contains about seventy-two per cent of silica, fifteen of alumina, seven of alkalies, and five of lime, magnesia and oxyd of iron.

ANÆSTHETIC AGENTS.

Mr. T. D. Stetson—In regard to the anæsthetic agent alluded to by the chairman, I wish to enquire whether it is safe, or if the nitrous oxide now given principally by dentists is to be preferred.

The Chairman—All anæsthetic agents might be regarded as dangerous, unless administered with great caution. The reason of this will be perceived if we look at the formula of the several compounds alluded to; chloroform being $C_2\ H\ Cl_3$; Ether $C_4\ H_5\ O$; Nitrous Oxide $N\ O$; the latter contains only the principal elements of common air. Amylene, $C_{10}\ H_{10}$, has been employed in surgical operations, but frequently with fatal results. Its use is abandoned. The nitrate of Amyl, $C_{10}\ H_{11}\ N\ O_6$, found by Dr. Richardson to suspend the action of the heart, cannot be taken with safety.

Common air is a mechanical mixture of four volumes of nitrogen, one of oxygen, with a little carbonic acid, water, and a trace of ammonia, Nitrous oxide is vastly more energetic than air, because the relative amount of oxygen is doubled. Nitrous oxide was the first anæsthetic agent used. The discovery of its pain-alleviating power was made by the late Dr. Wells, of Hartford, Conn. Ether as an anæsthetic was introduced by Drs. Morton and Jackson, of Boston; chloroform by Dr. Simpson, of Edinburgh. One objection to nitrous oxide, or laughing gas, is, that its first effect is to excite the muscular system. It is said not to be uniformly efficacious in producing a state of partial insensibility. But there is certainly less danger in taking it into the lungs than the other compounds named. I do not think the use of the first three named agents should be discouraged when administered by skillful hands; the amount of pain and suffering they have prevented, no language can express.

New Steam Pressure Gauge.

Mr. Shaw, of the firm of Shaw and Justice, of Philadelphia, exhibited their patent mercurial pressure gauge. Mr. Shaw said:

The principle of its operation is the admission of pressure upon pistons of different dimensions giving the mercurial pressure the advantage of area, and thus employing short columns of mercury to balance high pressure.

It measures the pressure of steam upon the basis that the columns of mercury in the gauge exactly balances the pressure in the boiler without any other opposing medium.

This instrument is free from the objections urged against gauges made with springs, discs and diaphragms, all of which are liable to crystalization or variation by change of temperature. This gauge being open to atmospheric pressure, no imperfect registry can arise, as space for expansion by change of temperature is allowed in the mercury chamber, and no intervening medium of compressed air exists as in other mercury gauges.

The movements of the plunger not being more than 1-100 part of an inch in driving the mercury to the top of the tubes, the friction upon the gum diaphragms is not of any calculable importance.

Messrs. Rowell, Fisher and Simpson were appointed a committee to examine this guage.

Electricity and Magnetism.

The subject for the evening was here taken up.

Dr D. D. Parmelee.—When I first thought of this subject it appeared to be an easy one to treat of, and one that furnishes very large materials for discussion; but on further reflection I find that, though there are numerous facts connected with it, yet we have by no means as good an idea of it as of heat and light. It is known mostly by its effects, like many other agents treated of in the natural sciences, so it would not be proper or interesting to occupy your time with useless theories; but I will endeavor to confine myself to some prominent facts connected with it. Electricity seems diffused over every portion of matter with which we are acquainted, and can be taken from surrounding bodies. It produces both chemical and physical effects. The views of most scientific men are not matured on this subject, but incline to the theory which the investigations of Faraday tend to sustain. Thermo-electricity is that form of this agent which is developed by the aid of heat. It was discovered by Prof. Seebeck, of Berlin, in 1822.

He found that if the junction of two dissimilar metals were heated, an electrical current would flow from one to the other. From this form of electricity we may expect in time important results, and though in this mode of electricity the currents are weak, still, in my opinion, investigations pursued in this direction will develop means to strengthen them. It may not be uninteresting to recall to mind the lengthy discussion carried on between Galvani and Volta. The former was of opinion that a peculiar fluid was secreted in the brain, which was sent along the nerves to all the different parts of the body; that the muscles were capable of being charged with it, and that convulsions produced in the muscles were produced by a discharge of the nervous energy from the muscle, in consequence of the conducting power of the metals. Volta was of a different opinion, and argued that these conditions were produced by the passage of a current of common electricity through the limb of the frog, which was thrown into a state of convulsions merely in consequence of its irritability.

The Franklinian theory of one electricity, though popularly received and acted upon, fails to explain with entire satisfaction some peculiarities of electrical phenomena. For example, two balls, resinously or negatively electrified, repel each other.

Cavendish and Epenius, in explaining this, supposed all particles to repel each other without electricity. There are three epochs in the history of electro-magnetism. The first being that of Galvani and Volta's discussions; the second Profs. Oersted, Henry and Faraday's discoveries; and the third the developments of the electro-magnetic telegraph. About twenty years regularly intervened between these successive steps.

All telegraphic machines are so many electro-magnetic engines, the force or power-producing apparatus being situated many miles from the engine, and a mine employed to carry the moving agent precisely as a tube would be employed if compressed air, carbonic acid or other gas were used in the place of electricity. No encouraging success has yet attended the attempts to employ electricity as an economic power. When we reflect on the cost of the coal used to produce power by steam, and the cost of zinc to generate power by electricity, the advantage is much in favor of the coal.

By instituting a comparison between the different means of producing power, it has been shown that for every shilling expended there might be raised:

By manual power, 600,000 pounds one foot high in a day.
By horse power, 3,600,000 do do do
By steam power, 56,000,000 do do do
By electro-magnetism, 900,000 do do do

Electro-metallurgy is of much more industrial importance than would be supposed by a casual observer. If the number of persons employed in electro silver-plating, deposition of copper, and electro-stereotyping in this city were named, there are few present who would not be surprised. At Birmingham, England, 500 operatives were employed a short time since in one factory.

Electricity as a remedial agent cannot be highly valued, for its action is only a muscle excitement or exerciser. It is a popular habit to refer all phenomena, which appear too complicated for immediate understanding, to electrical agency; and it is certainly a very easy mode of disposing of a subject. But what is electricity? I remember being present a few years since, when a young man, not a student of chemistry, however, asked Dr. Charles T. Jackson what catalysis meant. He replied that it really meant "what God knows but man does not." The word electricity is quite popularly employed in this sense.

My reflections led me, as I have said before, to attach much importance to thermo-electricity, as heat cannot be converted into electricity and electricity into heat. And the time may not be far distant when this mode will be employed to light our factories, and even perform labor. Eventually electricity may be made to complete a circuit of changes like water, which, after turning the mill wheel, evaporates into the clouds and again descends in rain, thus swelling the stream and doing the same work over again.

The lateness of the hour prevented any further discussion of this subject, and it was therefore continued for the next meeting.

Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
December 31*st*, 1863.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

Mr. J. K. Fisher exhibited a drawing of his plan for a steam omnibus.

THE ACTION OF WATER UPON LEAD PIPE.

Prof. Everett, chairman of the committee on the use of lead pipe for conveying water, and tin-lined lead pipe, made the following report, which was accepted:

LEAD PIPE.

Your Committee have thought it expedient, before entering in details upon the subject before us, viz.: "The action of water upon lead pipe," to give a short account of the chemistry of both lead and tin, to be followed by a brief comparison of these interesting metals.

Lead has been known from the earliest times, and even among uncivilized nations it has been in use, probably from the ease with which it is reduced to the metallic state from the ore which contains it, for lead is seldom, if ever, found in nature in the form of metal, but most generally in combination with sulphur forming a sulphuret of lead or galena, which, when pure, contains 86.66 per cent. of lead, color, bluish gray, with a high lustre when freshly cut, but which, when exposed to the action of air, soon disappears by the formation of a slight coating of sub-oxide, which is the cause of the usual dull appearance of lead; it melts at about 612°, and has a specific gravity of 11.33 or nearly twelve times the weight of an equal volume of water.

A knowledge of the action of the most common of the mineral acids upon lead, is important to enable the investigator to form an intelligent opinion upon the question before us, and equally important in its bearings on the test of the detection of lead when in solution, which, fortunately are very delicate, and can be used with the most convincing effect, by any one interested enough in the subject to employ the means herewith described under the head of

BEHAVIOR OF THE METAL LEAD AND ITS OXIDES WITH REAGENTS.

Metallic lead is completely dissolved by nitric acid and water, forming a clear colorless solution of nitrate of lead.

By taking a solution of lead, obtaining either directly by the action of nitric acid upon metallic lead, or by dissolving sugar of lead in water, and to the solution thus obtained, which to the eye, will, to all appearance, resemble water, and a few drops of sulphuric acid, immediately is formed a white precipitate of sulphate of lead ; or, if muriatic acid is employed, we obtain a chloride of lead. Now both these precipitates are formed from the acid coming in contact with the lead in solution, uniting with it, and forming a nearly insoluble sulphate, or chloride, as the case may be.

Now the reason these tests are not sufficient to detect a small quantity of lead, is, that though called insoluble, yet to a certain extent, in very large quantities of water, it is soluble, and, therefore, will not precipitate ; fortunately, however, we have tests so extremely delicate that nothing more can be desired, if due care is exercised in applying the reagents, and observing the results ; and what still further adds to the certainty of these reactions, is the great diversity of color obtained in the various precipitates formed by different tests.

First on the lists is sulphuretted hydrogen, either in the form of gas, or liquid hydro-sulphuric acid, which is only a solution of the gas in water and is so extremely delicate a test for lead that a black precipitate is formed of the sulphide of lead, when this gas is applied to water containing lead in solution, and when the quantity is so small that no visible precipitate is formed, its presence is recognized by a brownish black color, imparted to the water.

If a solution of either the yellow chromate or red bichromate of potash is added to solutions of lead, a light yellow in the former, and an orange yellow precipitate in the latter case, will be produced. This, though a characteristic, is not so delicate a test as sulphuretted hydrogen gas, or its solution in water. Iodide of potassium produces a splendid yellow precipitate.

It may, as a general thing, be granted, subject to few exceptions, that the same changes will be produced by the action of air upon metal, to a greater or less degree, when exposed to the atmosphere for a long time, as will be produced immediately by the atmosphere, if aided by the application of heat to the melting point of the metal. It may, therefore, be useful to observe the effect of a combined action of air and heat when applied to lead. After removing the dross which has formed upon its surface during the process of melting, we expose a metallic surface of almost silvery brightness, but almost immediately this becomes dim and dull from the formation of a sub-oxide of lead, and a mixture perhaps of metallic lead, and oxide of lead, which floats on top of the melted metal ; now, remove this as often as you will, and it is instantly replaced, and thus you can go on indefinitely until all your lead is converted into this sub-oxide ; a dull, ash-colored powder, which will now weigh as much more than the lead originally melted, as it has absorbed oxygen from the air. Now, if this sub-oxide is again heated and exposed to the air, it will undergo another change by absorbing more oxygen, and becoming converted into oxide of lead. As already stated, this effect can be produced very quickly by the aid of heat, but equally certain and sure is the action, though requiring a longer time, when exposed to atmospheric influence.

Tin was well known in very ancient times, and we have reason for thinking that it was obtained by the Phenecians from Cornwall, in England, 1,000 years before Christ. The great contrast between lead and tin commences with the ores, as the oxide of tin, or tin-stone, which is the most common ore from which tin is obtained, is as hard to decompose as lead is easy.

Tin has, when, pure, almost a silvery whiteness, and will maintain its lustre when exposed to the action of the air for a long time, because it is by no means easily oxydised like lead.

Nitric acid will not dissolve it, but converts it into an insoluble binoxide of tin. Sulphuric and muriatic acids will dissolve it however, but neutral sulphates and chlorides will not.

Having thus slightly touched upon some of the most important and characteristic properties of these two metals, we will next consider the action of water upon lead.

It is frequently remarked, and repeated so often, that it passes as an established fact, that pure water has more action on metallic lead than impure water. Your committee incline to the opinion that this error has caused much misunderstanding, and it is only under certain circumstances that it is true; an explanation of this may serve to make the subject more easily understood.

The facts of the case appear to be as follows:

Pure distilled water, from which the air has been expelled by boiling, will not, if excluded carefully from the action of the air, be acted upon by lead; in other words, pure lead will not decompose pure water, if the air is excluded. This is shown by lead remaining bright, when immersed in water under such circumstances But if pure water, either distilled water or rain water containing air, and exposed to the action of the atmosphere, we find a more rapid action upon lead than if saline impurities, like chlorides, sulphates and carbonates of soda, lime, &c., were present in small quantities.

If a moment's reflection is given to this, the reason is evident. When the water is perfectly pure, in order to oxydise the lead, the water must be decomposed and hydrogen set free, while oxygen unites with the lead, to form an oxide or sub-oxide of lead. Taking into consideration the well known difficulty of decomposing water, this looks upon its face unreasonable; but when we find the result as stated, we have only a confirmation of our theory. We have, therefore, to look to some other causes than the purity of water, for the action of distilled water upon lead when exposed to atmospheric air, and this we find in the oxygen held in solution and constantly absorbed by water from the atmosphere, and it is very easy to account for the change of the oxide of lead into carbonates of lead, from the same quarter, as it is well known our atmosphere contains always more or less carbonic acid.

Having thus traced the action of water upon lead, and shown that to the air contained in the water, rather than to the water itself, is due the oxydation of lead, we now would see how far this action is retarded by impurities or saline matter in solution. If a sulphate or chloride were present, the corresponding sulphate of lead or chloride of lead, would be formed, which, as already stated, would, in a measure, be a protection to further oxydation. But it will not do to flatter ourselves that by increasing the impurities we lessen the danger, as the presence of organic matter in large quantities will vastly increase the action, besides having a tendency to decompose the sulphate and chloride of lead already formed, and thus allow fresh action to commence upon the lead. Your committee do not think it worth while to refer at length to the fact, that tin is not oxydised with the same facility as lead, nor are the salts of tin, if formed, rank poison, like those of lead. Our common sense, and the judgment of mankind, agree on this point, as is shown by the use for the last two thousand years of tin, in a vast number of cases, where lead is excluded by common consent.

Your committee have thought that the investigations instigated by the water commissioners in Boston, about the time of the introduction of the water, in that city, would throw much light upon the subject, and have, therefore, taken pains to arrive at the reasons which induced the commissioners to use lead pipe for service pipe, from the street mains, and as the following review will show, appear to have used lead because it was not practicable at that time, to find anything better. Not that lead pipe was unexceptionable by any means.

The Boston water commissioners were placed in a singular situation. First, they had called upon the consulting physicians of Boston for an opinion, and, in reply, obtained a long report from that body, in which, after alluding to the testimony for and against the use of lead pipe, say: "The cheapness of this metal, its ductility, flexibility, and the ease with which it is wrought, have caused it to be employed for service pipes more than all the other materials together. Leaden pipes are liable to be corroded by the water of certain wells and springs, and probably also by rain water. But in the water of open lakes and streams, which are comparatively free from saline ingredients, and which contain portions of organic matter, these pipes are durable for a long time. Lead, in aqueducts, has often been suspected of insalubrity, abandoned, replaced with other materials, and again restored;" and then go on to give a list of the alarming effects of lead introduced into the human system, but immediately following, add: "That notwithstanding these general facts, a large portion of the population of Boston, Philadelphia, New York, and London, have, for years, consumed the water introduced from various sources through leaden pipes, with apparent impunity:" and finally conclude with a statement of having placed the matter in the hands of eminent chemists for further investigation, but they consider, as far as health is concerned—

"1. That pipes, made of cast or wrought iron, may be safely used for the transmission of water, as far as health is concerned.

"2. That copper pipes, effectually tinned throughout by reliable workmen, are a safe material for the contemplated transmission of water to dwelling houses in Boston, so long as the internal coating keeps in repair.

"3. That although leaden pipes in certain waters, and under certain circumstances, are known to communicate a highly deleterious quality to their contents, yet in the open waters, from which the large cities, already named, have been supplied through such pipes, no practical evil, of a general nature, is known to this Board to have resulted from their employment.

"4. That when individuals may prefer not to employ, for purposes of food, water which has passed through leaden pipes, they may introduce it into a lower reservoir through pipes of iron, or other safe material, and conduct it from thence for other purposes, to different parts of the house, through lead tubes, properly guarded by stop-cocks, valves, or other mechanism;" and thus leave the commissioners in much the same doubt as before ; the whole report is very non-committal, but evidently leaning toward the use of lead, without the boldness to take the responsibility upon themselves of advising its use.

We now take up the chemical testimony, commencing with Dr. Hayes, of Lowell, at present of Boston, who uses the following language :

"It has been supposed, from imperfect experiments, that waters containing certain small portions of salts, do not act on lead. Some years have passed since the opinion, favoring such a conclusion, was published. The lapse of that time has permitted the accumulation of facts and observations, which, placing the fallacy of such an opinion beyond doubt, have established the conclusion, that, *all natural waters act on lead chemically, under the varying states of atmospheric changes.* Lead, as a material for pipes, cannot be safely used for conducting water, which is to be used for domestic purposes. The water, from the source of supply, for the city of Boston, has, in a high degree, the power of destroying lead pipes ; and even salts, in a crystalized form, have been observed to result from this action." And afterwards remarks upon the kinds of lead pipe in use :

"Two kinds of lead pipe are found in commerce ; the one made by the 'patent' process, in which heated lead is forced through dies, has its surfaces imperfectly coated with tin. The other, cold drawn from thick tube, in general use, better resists corrosion." Thus confirming your committee in the belief already formed, that the manner of tinning lead pipe up to that time, was not satisfactory. Dr. Hayes also makes the following important statement : "The *quantity* of metal dissolved and suspended, was several times obtained. Metallic lead, in a globule as large as an ordinary pin head, was obtained from one quart of Cochituate water, after twenty-four hours exposure, as a mean result."

Dr. Jackson, of Boston, and Prof. Silliman, of New Haven, also confirm Drs. Webster and Hayes' opinion, as well as Dr. Dana, of Lowell.

Up to this point, all the opinions of the chemists employed by the commissioners to investigate the subject, had been decidedly adverse to the use of lead pipe. In the meantime, Prof. Horsford had been engaged in a series of experiments upon this subject, and your committee wish to call your attention to this report, as it was the result of a long continued comparison of various waters from New York, Philadelphia, Albany, Troy, Cambridge, and Boston. Upon the commencement of his investigations, he gives the following as the conclusion arrived at, from an examination of the "literature of the old world" in relation to it:

"1st. That some natural waters may be served from leaden pipes without detriment to health.

"2d. That others may not; and,

"3d. That we have no method of determining beforehand whether a given water may or may not be transmitted safely through lead."

After a series of carefully conducted experiments, the details of which are given, he comes to the following conclusion:

"The preceding experiments, as a whole, go to show that Cochituate water may be distributed through iron mains and leaden service pipes with as little danger as Schuylkill, Croton, or Jamaica water." Subsequently he gives the authority of various doctors and chemists upon the question, and from the above draws the inference that, "From the great similarity of Cochituate to Jamaica, Croton, and Schuylkill waters, in its relations to lead, that the quantity of lead that will be dissolved in Cochituate water in actual service, will, for all practical purposes, be of no moment."

The water commissioners, not finding their chemists to agree, dispatched their consulting engineer to this city, who obtained the opinion of Mr. Coffin, President of the Water Board, in favor of the use of lead pipe, and also the unanimous declaration of all the New York plumbers, who were consulted, but could not recollect "To have heard of any complaints that lead pipe had injured any person." This, coupled with the difficulty of finding a proper substitute, determined the commissioners to adopt lead pipe.

Your committee have been at some pains to ascertain the opinions of physicians in relation to cases of lead poisoning, due to Croton water served through lead pipes.

Dr. Percy mentioned two cases, in which the cause could only be traced to the use of water drawn through lead pipes.

Four cases of great interest, given of lead poisoning, can be found in the *New York Journal of Medicine*, 1851, under the head, "Remarks upon the use of lead as conduit or reservoir for water for domestic purposes, with cases of lead colic resulting from that cause." Other cases have come to the knowledge of your committee, though not so clearly to be traced to the same cause as those already referred to.

As an example, however, of how such cases may be overlooked by physicians, or ascribed to other causes, there is appended to this report an account of the sickness for a long time, and subsequent recovery, of the Rev. Dr. Lamson, of Dedham, Mass., and in this case the cause is clearly traced.

Many other cases occurred at Dedham about the same time, and the use of lead pipe was adandoned, with the most happy effect.

In conclusion, your committee would report that, after having carefully examined both foreign and domestic authority, they are forced to the conclusion that it is far safer to abandon the use of lead pipe than to depend upon the chance of having the water drawn through the pipe before using it, as recommended by the advocates of its use: and further, your commit tee are strongly in favor of recommending the use of lead pipe, covered in the inside with tin, in the manner exhibited before this Association,* as not only answering all the requirements of the plumber, but at the same time completely obviating all risk of danger, and this too at little or no advance of cost over the common lead pipe. The lead pipes mostly used in England and Scotland are alloyed with about five per cent. of tin, which, it is claimed, affords some protection to the lead, as it undoubtedly does.

The objection urged to the tin-lined lead pipe, on account of the supposed galvanic action, is not considered as an objection, as the action, if any, is so slight as to be thrown out of account. The chairman of your committee has very frequently tested the Croton water for lead, and seldom, if ever, failed to detect its presence when drawn through lead pipes.

All of which is respectfully submitted.

A. H. EVERETT,
JOHN B. RICH,
DUBOIS D. PARMELEE.

The Chairman read the following summary of recent scientific intelligence.

PHOSPHORUS.

A new source for obtaining phosphorus is found in the mineral *Sombrerite*, from Sombrero, one of the Antilles. It contains sixty-five per cent of phosphate of lime and seventeen per cent of the phosphate of alumina.

CASTOR OIL.

This oil is manufactured in this country to a considerable extent. It is extracted from the plant *Recinus Communis.* It was known to the Egyptians, Grecians and Romans. According to Saussure it contains 74.17 per cent of carbon, 11.03 of hydrogen, and 14.79 of oxygen. It is the heaviest of the fixed oils. It dissolves in its own volume of pure alcohol, and when mixed with collodion forms a thick tenacious mass.

ARTIFICIAL MARBLE.

Prof. Rose of Berlin has confirmed Sir James Hall's statement with regard to the change produced in carbonate of lime; arragonite and lithographic limestone after being exposed in an iron cylinder or a porcelain bottle, to a white heat for half an hour, were converted into crystalized limestone.

DECORTICATION OF CEREALS.

M. Poissant's plan for peeling the kernels of wheat or other grains, is to dip them in cold water and immediately dry them, after which they are subjected to the action of two rapidly revolving blades which bring the kernels in contact with each other, causing a speedy expansion and separation of the skins which are driven off by fanning. Charles Davidson, C. E., thus states the advantages of this process:

1st. The decorticated grain will always be profitable to the world as it incontestably yields from ten to twelve per cent more flour than ordinary millering.

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* Willard & Shaw's Patent.

2d. It can be done in either small or large quantities, and not only produces more flour but at the same time more glutinous nourishment.

3d. It is not attacked by the weevil and is therefore fit for storing against seasons of scarcity.

4th. The pellicle produced makes an excellent vellum-like paper which is largely sought after in France by booksellers.

Petroleum Gas.

According to a report made by M. G. Brower fifteen gallons of crude petroleum will make 1,200 cubic feet of gas, equal in illuminating power to about 3,500 cubic feet of coal gas. The cost of this amount of light, the price of crude oil being twenty-four cents, is only five dollars and a quarter.

Conductors of Electricity.

The conducting power of metals when heated decreases from zero to 100 Centigrade, about twenty-nine per cent. Thallium and iron exceed this average and nickel and cobalt fall short. The following is the order of conducting power of the most important metals: silver, copper, gold, zinc, cadmium, cobalt, iron, nickel, tin, thallium, lead, arsenic, antimony, bismuth.

Chemical Manufactures on the Tyne.

Mr. J. C. Stevenson presented to the British association for the advancement of science, an interesting account of chemical operations on the Tyne. The principal crude materials used are salt, chalk, coals, sulphur (including pyrites), French limestone, resin and tallow. The principal finished products are soda ash, crystals of soda, bicarbonate of soda, bleaching powder and soap. The value of the annual production exceeds five million dollars. In America this kind of manufacture is almost unknown. We use more soda compounds for soap making than any other nation. These are all imported, although the crude material required in the chemical processes for making soda ash are here both cheap and abundant.

Electricity and Magnetism.

This subject, continued from the last meeting, was here resumed.

Dr. Jerome Kidder exhibited his electro-magnetic machine, for medical purposes, and spoke of cases where it had been beneficial. He also electro-plated some brass articles held in a solution of the cyanide of silver while the electric current was passing through his body.

Dr. Parmelee.—Electricity has been in use for a long time for medical purposes; its action on the body, by producing shocks and twitching of the muscles, induced medical men to expect great results from its use, but in these expectations I may say they have in most cases been disappointed. There are, however, cases where this machine may be necessary; as far as the electric shock tends to bring the lungs into action, it is no doubt beneficial. Literary men are injured by not allowing full play to the lungs. When our attention to any subject is intense, we are apt to *hold the breath;* this is exceedingly injurious. I believe a large portion of the ill-health of literary men can be attributed to this cause, and if electricity can alleviate any of the ills arising from sedentary habits, the fact should be known.

The Chairman.—In the hope of giving this discussion another direction, I will endeavor to correct some popular errors. The term "electric current," in such common use, tends to mislead, for it implies the passage of a fluid, and this has not been proved. Light, heat and actinism are effects produced by the undulatory motion of the all-pervading, all-permeating, ether or œth.

There is a correllation between these forces and electricity and magnetism, but it does not follow that the two latter are the results of wave motion. Electricity is a force which probably has its pathway through the condensed ether, forming the atmosphere of the atoms of which all ponderable bodies are composed. It may pass almost instantly through a wire a thousand miles long, as the force of one mass can pass into another; this may be illustrated by suspending by strings a number of ivory balls, so that they will touch each other. If the first ball be swung back and allowed to strike the second, the force is instantly conveyed through the intermediate balls to the last one, which alone flies from its position. This transmission of force is further illustrated by placing two pieces of coin on a table in contact with each other, if the second be held firmly down, and a third coin thrown against its edge, opposite the edge of contact, the first coin will be instantly thrown from its original position.

We are indebted to Faraday for many interesting facts regarding magnetism. He has shown that oxygen and many other elements are magnetic. He passed the gases between the poles of a large U electro-magnet, and found some were deflected from their original direction by the magnetic force. The space between the poles is an interesting field of observation, a copper plate is impeded in its movements, while in this magnetic field, and even a cube of glass, held in this space, is so affected as to change the action of a polarized ray of light.

The Chairman, after congratulating the members on the manner in which they had spent the closing hours of the old year, announced that this subject would be continued at the next meeting. Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
January 7, 1864.

Chairman, S. D. Tillman, Esq; Secretary, Mr. B. Garvey.

Mr. D. Minthorne exhibited a governor for steam engines, the invention of Mr. J. H. Pomeroy, of Syracuse, which was constructed with two arms, on the outer ends of which were placed a fan. A short distance from the upright shaft, which supported these arms, was a circular inclined plane, that revolved with the arms; but whenever the velocity was increased the resistance of the air, acting on the fans, caused the arms to ascend the circular inclined planes, thus closing the steam throttle valve in proportion to the height the arms ascended.

Mr. J. K. Fisher.—In working the model here, I find that it closes up the throttle valve from a very slight resistance. If it were in use on a marine engine, and the paddle wheels rose out of the water, there would of course be a great increase of speed, which would suddenly close the throttle valve; but in this apparatus it would open just as sudden. If the valve could be kept closed until the wheels had again entered the water, there would be an advantage in its use, as it appears to act very suddenly. This improvement I have no doubt can be made.

The Chairman.—The Watt governor, so called, was not invented by Watt, but was in use long before the steam engine was known, for the purpose of regulating the speed of water wheels.

WATER PIPES.

Mr. Benjamin Garvey read the following report on the use of various metallic pipes, for conveying water, which was accepted:

The committee appointed by the Polytechnic Association of the American Institute to examine and report upon "Various kinds of pipes for conveying water," with a view to determining their relative mechanical and economical advantages, respectfully report: That they have deemed it unnecessary to report on any pipes but those of iron, lead, tin, and tin-lined lead, as these are the only materials which have been made available to any great extent, for conveying water to and through dwellings.

1st. They find that iron is the best material for pipes of considerable diameter, combining, as it does, strength, cheapness and durability with facility of manufacture and employment; but that the mode of making joints by couplings or cement is far inferior to soldering for the plumber's use, and that the rigidity of iron pipe which prevents it accommodating itself to the change of form produced in the place where it is employed, (by settlement, swagging of timbers, &c.,) unfits it for plumber's work. Its liability to rust, by the deposition of hygrometric moisture on the outside, and the liability of this deposition to drip and give rust stains in ceilings and walls, is another serious objection to its use in dwellings. Iron pipe is also difficult of repair, requiring generally a whole length to be removed for a slight defect in any part. The liability to rust is, however, well counteracted by enamelling, galvanizing or tinning, processes which are applicable to large pipes more especially, and which add considerably to the cost. Iron seems to be the best material for large pipes embedded in the earth, or used in continuous and rigid lengths well supported.

2d. Lead they find to be the most easily manufactured and worked of any metal yet introduced for conveying water through houses, so that it has come to be the almost universal material employed throughout the world, and has given its name to the mechanical art of conveying water into and through houses. Lead readily accommodates itself to the place where it is employed; joints can be made in lead more readily than in any of the other metals named, and defects in lead pipe are more readily obviated, or breaks repaired, than in pipes of any other metal, and for small pipes, such as are required for plumber's work, no material in use is cheaper or more easily employed. If lead were not injurious to health it would be the best material for water-pipes, and is now the most generally employed material for that purpose.

3d. Block tin presented more difficulty to your committee. They have had exhibited to them specimens of pipe purporting to be of block tin, which were in reality an alloy of tin and lead, having all the poisonous defects of lead, without its mechanical or economical advantages. Pipe which they have since seen seems not to be so alloyed. It cannot, however, be manufactured in large lengths. It is worked with difficulty, and requires special skill in the workman. In cost, it would be at least four times that of the simple lead pipe for the same work, and though not generally acted upon by the water passing through it, it is yet speedily acted upon by external agents which destroy it sooner than they destroy iron, and much sooner than lead. These defects may be due to impurities in the tin, and this kind of pipe may have special uses for which it is admirably adapted, but for ordinary plumbing it is too expensive and does not possess any great compensating advantages.

4th. Tin-lined lead pipe combines the advantages of lead pipe, in the ease with which it is made and worked, with the advantages of tin pipe in not poisoning the water which flows through it. There is no more difficulty in employing this kind of pipe than in using lead pipe, as any ordinary plumber can bend, join and solder it with ease. It is manufactured in as long lengths as lead pipe, and does not require a special solder or special skill which may not be readily obtainable when repairs are needed. The lead covering protects the tin from corrosive agents on the outside, while the tin lining protects the water from the poisonous effects of lead.

In conclusion, your committee report that for all cases where iron or lead can be used, these are the cheapest and best materials; and that where lead alone would be dangerous to health, the tin-lined lead pipe exhibited to them seems to be the neatest and simplest, and most practicable device for combining the useful mechanical qualities of lead with the qualities of tin which preserve the water, conveyed through such pipes, pure and healthy.

All which is respectfully submitted.

BENJAMIN GARVEY.
RODMAN B. DAWSON.

Mr. Garvey.—The first pipe which was submitted to us I had analyzed, when it was found to be alloyed with lead. As far as my experience goes I find that the pure tin pipe could not be worked with any degree of dexterity, and I also find that the solder for it could not be had for less than $2 a pound.

The Chairman read the following interesting summary of scientific news:

VANADIUM.

This metal, now used in making ink, is found in small quantity in English pig iron, according to the report of Mr. Riley to the London Chemical Society. It is also in the French mineral bauxite, and in a variety of iron ochre. A minute portion of Vanadic acid or Vanadate of Ammonia, added to a solution of nut galls, produces an intensely black ink, indelible by the ordinary substances which remove the color of common writing ink.

NICKEL.

Nickel ore has been discovered in large quantities in the Ramapo mountains, in Bergen county, New Jersey, which it is said can be profitably worked.

English Pig Iron.

The amount of iron produced in Great Britain for the year ending in 1863 is 4,000,000 tons.

Oxide of a New Metal.

M. Bahr has observed in a Swedish mineral a white powder, slightly tinged with red, which he believes to be an oxide of a new metal. It forms only one per cent. of a mineral of very complex composition, which he calls Wasite. The new metal is named Wasium, after the god Wasa. It should be stated that M. Nickles maintains in the *Comptes Rendus* that the so called Wasium is impure Yttria, containing some Didymium or Terbium. If the report of M. Bahr should be confirmed, and the new metal separated, the number of chemical elements or undecomposed substances will be increased to sixty-seven.

Relative Distances of the Planets.

Bode's law, which expressed the distances of the planets from the sun, by assuming Mercury to be four, and adding that number to the geometrical progression of three for each succeeding planet, counting the Asteroids as one planet, holds nearly true to Uranus, but differs widely from the observed distance of Neptune. This discrepancy has led to several ingenious calculations of late; none of them, however, present ratios approximating sufficiently near the astronomical measurements to be accepted.

Tropical Africa.

Baron Von Decken has communicated to the Royal Geographical Society an interesting account of his travels in Zanguebar. Leaving the eastern coast at Mombas he passed through Wanga and Ugono to Lake Jipe and the Arusha range of mountains. The snowy peaks, Kilima-ndjaro, were found by triangulation to be 20,065 feet and 17,000 feet respectively in height. One of these mountains he ascended to the height of 13,900 feet. The line of perpetual snow is at 17,000 feet. In Ugono he found a well formed race, sufficiently civilized to smelt iron and manufacture it into weapons. A minute description is given of a fly, called by the natives "Donderobo," whose bite is fatal to some quadrupeds, and whose attack upon the asses belonging to the caravan of the Baron seriously endangered the expedition.

Oxygen in Organic Compounds.

Messrs. Wanklyn and Frank have noticed that organic bodies evolve some if not the whole of their oxygen in the form of water, and found upon this fact a qualitative if not a quantitative method of determining oxygen.

Molecular Mobility of Gases.

Prof. Graham, master of the mint, London, to whom, with Dutrochet, we are indebted for many observations relating to osmetic force, has lately presented in the Philosophical Transactions some new experiments on the molecular mobility of gases. The inter-diffusion of gases without any intervening septum, is a subject of great interest. Carbonic acid was found to travel in common air, by diffusion, at the rate of 73 millimeters per minute. Hydrogen was found to travel *downwards* at the rate of 350 m.m.

per minute, or five times more rapidly than carbonic acid ascended. It is certainly remarkable, he concludes, that in perfectly still air carbonic acid molecules should spontaneously alter their positions and move a distance of half a metre, in any direction, in the course of five or six minutes. The molecules of hydrogen can disperse themselves to the distance of a third of a metre in a single minute. Such a molecular movement may become the agency of considerable power in distributing heat through a volume of gas. It appears to account for the highly convective power observed in hydrogen, the most diffusive of gases.

The New Chlorides.

Mr. Bottger has examined a substance found in the mother liquors from the Nauheim salt works, used considerably by confectioners as a freezing mixture. He has obtained from it, in addition to the chlorides of potassium, sodium and magnesium, the chlorides of cœsium and rubidinum, with traces of chloride of thallium, from which fact and other properties, altho' it is precipitated by sulphuretted hydrogen, he concludes that thallium should be ranked with the alkalies.

Coal in Great Britain.

The available supply of coal in Great Britain, is estimated by Professor Ansted, at 35,000 millions of tons; and he agrees with Sir W. Armstrong, that with the present system of mining and the increased rate of consumption, now exceeding 100 millions of tons per annum, two or three centuries will exhaust England as a coal producing country. This is a startling statement to those who comprehend the fact that the real power of Great Britain is derived from her coal fields.

Importation of Soda Compounds.

From the 1st of January, 1862, to the 30th of June, 1863, the soda imports into the port of New York alone, are as follows:

Soda ash, 26,848 tons; bi-carbonate of soda, 13,368 tons; sal soda, 7,997 tons; bleaching powders, 7,760 tons; caustic soda, 2,858 tons. In this estimate the ton is rated at 2,000 lbs. The total value of these compounds at the present wholesale prices, is, in round numbers, $5,500,000.

In relation to this item, the chairman stated that he had received the information directly from the custom house. He wished to direct attention to the importance of manufacturing the articles enumerated in this country. Coal, common salt, and limestone, are the chief raw materials required to make the finished products. These materials can be had as cheap here as elsewhere, and he could see no reason why, with the protective duty now imposed on the imported article, there would be any risk in attempting to compete with foreign manufacturers. In mechanical branches, our people evince great ingenuity, and by labor saving inventions manage to manufacture as cheaply as others do in the old world where the laborer is poorly paid; but in chemical manufactures we have not shown the same comparitive advance. The field is large, but the workers are few. Those who enter it now will find but little home competition, and hence there is a fair prospect of their reaping a golden harvest.

ELECTRICITY AND MAGNETISM.

This subject, continued from the last meeting, was here resumed.

The Chairman.—I noticed an article in the Tribune a few days ago in relation to an improvement in electro-magnetism, in which expectations were expressed by the editor that steam would be superceded by electricity; but when we reflect that power generated by electro-magnetism, has been estimated to cost about fifty times that of steam, and that Dr. Page, of Washington, admitted that by the use of his electro-motive engine it could be reduced to a cost only to twenty times that of steam, it will be seen how unfounded such expectations are. Electricity is generated by the combustion of metals; for instance, oxygen unites with zinc and electric force is given off. If we compare the cost of zinc the cheapest positive metal used, and of coal, we will find a vast difference in favor of the heat-force generated by coal.

Mr. George Bartlett.—Mr. Beardsley's invention alluded to by the chairman, consists in a modified form of magnet, which he makes in a star shape, which amounts to the same thing as 3 U magnets of cast iron. These he makes of various sizes, and then a larger one is placed over these which are then put on a shaft and made to revolve by machinery—and in this way he produces his electro-magnetism. Recently he has applied this principle to the telegraph as it dispenses with a battery. He has an alphabet placed around a circle, and by turning the magnets, the electricity is made to turn this circular disc until a certain letter is arrived at, after which a brief pause is made and goes on to the next letter. This is so arranged that a person can read the words without any previous training. One very curious optical illusion was produced by this process. The magnets were turned round and the current was so arranged as to be broken, and the flashes of light were so bright that they seemed to be going in an opposite direction.

Mr. B. Garvey.—A device for producing signals which I saw in England several years ago, was in a disc form with a hand made to stand perpendicular, a horseshoe magnet drew the armature which started some clock work, and when the hand came to a certain letter the current was broken, after which the hand was set in motion until the next letter required was pointed at. This has now been abandoned as the mode of signalling by making dots into a piece of paper, or by alternations of long and short sounds gives all the letters required.

The Chairman.—The Morse telegraph is now, after a lapse of about twenty years, since its perfection, used throughout Europe, except in Great Britain, where the monopoly granted to Cook and Wheatstone, for the exclusive use of electricity for telegraphic purposes, still exists. The Cook and Wheatstone instrument hardly deserves the name of an invention. It was invented or proposed by Ampere in the year 1822. It is simply a modification of the old galvanometer needle, consisting of two or more needles, which by their various positions, made by the magnetic current, indicated the letters of the alphabet. At first five wires were required for each line It is a *sight* telegraph, and must be constantly watched when messages are being communicated. The vast telegraphic business of this country could not be done with such a contrivance. When the patent for it expires, the Morse telegraph will doubtless be used in England.

Prof. Henry, of Washington, made in 1829 the essential improvement in producing magnetic power, on which telegraphing depends. The largest electro-magnet made by him sustained a weight of nearly two tons. To excite this power it was not necessary that the battery should be near the magnet. The application of the power by Prof. Morse consisted in making the electro-magnet move a lever. It is evident that motion in only one direction could be made by it. This was used to bring the lever down so as to make a dot, by means of a pen at its end. If this pen continued to press while the substance it pressed was moving in one continuous direction, it is evident that *a line* would be made on the substance instead of a dot. To effect this, a wheel was set to rotating directly under the pen; over this a continuous strip of paper was passed, and thus was furnished the means of making both a dot and a line. When the pen was raised no mark was made. The elements thus obtained were a dot, line and space. An alphabet was constructed, each letter being expressed by one or more dots and lines—the letters most used in speaking being made with the least complex characters. The operator who wishes to communicate presses a key with one finger, connecting the wires so that an electric force is instantly sent to the opposite end of the wire, which may be hundreds of miles distant, where the magnet makes a mark upon the paper. If the finger of the operator is instantly raised, the key is also raised by a spring, and the current broken, consequently only *a dot* is made; but if the operator holds down the key for a brief space of time, *a line* is made instead. The communication is thus actually *written* upon paper, and there can be no misunderstanding it, if properly sent. Such communications have often been produced in courts of justice as evidence. Expert operators understand a telegram by *the sound* made by the lever at each time the current passes. A tick corresponds to a dot and silence to a long line. This knack greatly expedites business. For many years attacks have been made upon the claims of Morse to originality; these have grown out of attempts to infringe on his rights. The highest legal tribunal in the land has long since confirmed the validity of his patent. Prof. Morse commenced his experiments in 1832, and in 1836 he exhibited before the students of the N. Y. University his magnetic telegraph, embracing the essential characteristics of that now in use. It is the most simple, complete, and useful invention ever made. This practical application of a law of science by new combinations of mechanism, enabling persons separated from each other by hundreds of miles, to hold immediate and direct communication, has done more than social laws to bring people into nearer relations, and bind them in closer communion. The history of the telegraph illustrates the great truth which mere literary men fail to realize, that inventions are the prime movers in the melioration of mankind.

It was reserved for another ingenious American to devise such modifications in the telegraphic system, that a communication could be made *in print*, thus superceding the necessity of copying it, or rather of rendering it into our ordinary alphabetical symbols. The printing telegraph of House, in its mechanical arrangements is more complicated and therefore more wonderful than the writing telegraph of Morse. In House's arrangement electricity is only used to produce a correspondence of motion in the machinery at the different ends of the line. The type wheel, having on its periphery the twenty-six letters of the alphabet in capitals, and a period and hyphen, making twenty-eight characters, is revolved by twenty-eight teeth, the propelling power at each end of the line being a spring or weight, wound up by clock work. The wheel can only move the distance of one tooth when the circuit of electricity is broken or closed, consequently by breaking and closing the circuit fourteen times, the wheel would make one revolution. This is done very rapidly by means of condensed air, which gives to a rod a vibratory motion of only one-sixty-fourth of an inch. When the type wheel stops an eccentric brings down upon the letter exposed, already inked, the paper strip which receives the impression and moves forward one step, to be ready for another. The operator is placed before a key-board, having twenty-eight keys, or one for each character or letter. On this he spells the word, by pressing each key corresponding with the letters in it; as the type wheels revolve at the same speed, the spelling at one end and the printing at the other follows each movement. Other telegraphs have been invented. Mr. Morse is also the inventor of a chemical telegraph. Mr. Hughes is said to have expedited the action of the printing telegraph. These improvements were all made in this country, and it may be gratifying to some to know that just before the breaking out of the rebellion, the United States contained more miles of telegraphic lines than all the other countries combined.

Meteorology was the subject selected for the next discussion.

Adjourned.

American Institute Polytechnic Association,
January 14, 1864.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

The Chairman commenced the miscellaneous business by reading the following interesting summary of scientific news:

Essential Oils.

J. H. Gladstone, F. R. S., read before the London Chemical Society, December 3d, an interesting description of forty-seven different kinds of essential oils. From the tables of measurements presented by him the following facts are derived. The crude oils do not vary essentially in specific gravity, the majority being about 0.9 at 15.5° Centigrade. Penang Patchouli, Penang Citronella, Myrtle and Cassia were all slightly heavier than water. The density of the oil of wintergreen was 1.1423. Their action on light was found to be more refractive and dispersive than that of the lighter oils; the least action being from Bergamot and Cajeput. The difference in circular polarization was marked, no great dependence, however, is placed upon this characteristic, as samples of the same oils both crude and refined show wide differences. Most of the oils yielded hydro-carbons of the turpentine type $C_{20} H_{16}$. The oil of Birch bark, which gives the peculiar odor belonging to Russian leather, contains, among other bodies, a hydro-carbon resembling Cymole. Cedar wood and sandal wood oils are composed almost wholly of a viscid oxidized compound having a high boiling point. Cubebs, Calamus, Patchouli, Wormwood, Wild Camomile and Millefoil were found to contain an intensely blue coloring matter, resisting the action of most chemical agents, for which the name cerulean is proposed. The pure hydro-carbons derived from the oils examined have not generally powerful odors. Those of about .846 specific gravity have the lemony odor when freshly distilled and in their other characteristics resemble camphene. The boiling points vary nearly as their density. Wormwood, terebene, anise and mint have the lowest, being 160° C. Cubebs, Calamus and Patchouli boil at 260°. The boiling point of Colophene, 315°. is by far the highest in the whole list.

ADULTERATION OF FOOD.

The demand for chiccory, used in the adulteration of coffee, has been so great as to lead to an imitation of it made from roasted carrot. This may be called the adulteration of an adulteration. The chiccory dealers contend that their article is more healthy than coffee, while the dealers in the esculent root point to its wholesome action on both man and quadrupeds as an argument in favor of their substitute.

The best olive oil for the table is often adulterated with poppy, sesame or ground nut oils. The olive oil used by manufacturers is often mixed with colza oil, and the colza is in turn adulterated most frequently with whale oil. One of the best modes of discovering these admixtures, is to treat the oil with nitric acid, saturated with hyponitric acid, which converts the oleine of most of the non-drying oils into a solid substance, while the drying oils remain liquid. Geshardt states that one hundreth part of poppy oil, in olive oil, will delay the solidification forty minutes; another method is to treat the adulteration with caustic soda, or sulphuric acid, or nitric acid, and note the coloration. The test by density, proposed by M. Lefebore, is not considered available, owing to the slight difference in the specific gravity of a large number of the oils.

THE USE OF BROMINE IN PHOTOGRAPHY.

The English journals are claiming for John F. Goddard, of London, the credit of first using bromine in the daguerreotype process. He may have suggested its use, as others did, at an early day, but all attempts to use it were unsuccessful, until Dr. Saul Beck Goddard, of Philadelphia, in 1840, devised the plan of exposing the iodized mercury plate to the fumes of bromine, and again to the fumes of iodine. This plan was kept secret for two years, when it was revealed to certain parties in New York, and soon became public property. It is well established that the first portraits by Daguerre's process, were taken in America. Walcott expedited the process by his reflecting camera, which he took to Europe in 1840, but several minutes were required from the sitter, until the introduction of bromine, when the process became almost instantaneous.

Coal Oil Gas.

The city of Quebec, Canada, is now lighted by gas made entirely from coal oil.

Meteorology.

The subject for the evening was here taken up, when Mr. J. Disturnell read the following paper:

The subject of meteorology is of great interest when considered in relation to the wonderful effect of climate on the animal and the vegetable kingdom.

The difference in temperature between the equator and the north and south poles of the earth, is marked by five grand climatic divisions, viz: the Frigid, the Cold, the Temperate, the Subtropical and the Tropical or Equatorial Zones. The subject, however, to be presented at this time will relate to meteorological observations of the atmosphere at high elevations, also of the temperature of the earth at great depths, showing the great variations in heat as we ascend or descend from the earth's surface. Over our heads is to be found a cold stratum of atmosphere. This stratum descends from the altitude 18,000 feet at the equator to the earth's level at the arctic and antarctic circles, where perpetual frost or snow prevails. Recently a series of observations have been made, to which I wish to direct your attention.

Balloon Ascensions in Great Britain.

Under the auspices of the British Association for the advancement of Science, eight balloon ascensions have been recently made by Mr. Glaisher, the well known meteorologist, in the vicinity of London. The object of the ascensions was to determine the temperature of the air and its humidity at different elevations up to five miles; to compare the readings of an aneroid barometer with those of a mercurial barometer up to five miles; to determine the electrical state of the atmosphere, its oxygenic condition by means of ozone papers; to determine the time of vibration of a magnet on the earth and at different altitudes; to determine the temperature of the dew point by Daniell's dew point hygrometer and Regnault's condensing hygrometer, and the dry and wet bulb thermometer as ordinarily used, and by their use when under the influence of the aspirator, so that considerable volumes of air would be made to pass over both bulbs at different elevators as high as possible, but particularly up to those heights where man may be resident or where troops may be located, as in the high lands and plains of India; to note the height and kind of clouds, their density and thickness at different currents in the atmosphere, if possible to make observations on sound; to note atmospherical phenomena in general, and to make general observations.

In an ascent on the 17th of July, 1862, a height of 26,000 feet was reached, and in the descent a mass of vapor of 8,000 feet in thickness, was passed through, so dense that the balloon was not visible from the car. At starting, the temperature of the air was 59 degrees Fahrenheit; at 4,000 feet 45 degrees, and descended to 26 degrees at 10,000 feet, or about three degrees to the 1,000 feet, and then there was no variation of temperature between this height and 13,000 feet. During the time of passing through this space, says Mr. Glaisher, "Mr. Coxwell, my companion and myself both put on additional clothing, feeling certain that we should experience a temperature below zero before we reached an altitude of five miles; but to my surprise, at the height of 14,500 feet, the temperature, as shown by all the sensitive instruments, was 31 degrees, and to each successive reading up to 19,500 feet the temperature increased and was 43 degrees When we had risen somewhat, the temperature again began to decrease, and with extraordinary rapidity, and was 16 or 27 degrees less than it was twenty-six minutes before. At this time, about 11 A. M., we were at a height of five miles. In an ascent on the 20th of August, the balloon hovered for a long time over London, the hum of which was very audible, and when the city was lighted at night, it presented the appearance of an enormous conflagration.

The most important ascent however was made on the 5th of September, in which a greater elevation was obtained than had ever before been reached by human beings, rising upwards of 30,000 feet above the level of the sea, being about six miles, or 2,000 feet above the highest peak of the Himalaya mountains.

The ascension commenced at 1 P. M. They reached two miles in height at 1.21, three miles at 1.28, and four miles at 1.40; in ten minutes more they reached the fifth mile, and the temperature had passed below zero, and then read minus two degrees. Up to this time Mr. Glaisher had taken observations with comfort; soon, however, both observers breathed with difficulty, and began to feel unpleasant—their sight became dim, and their hands almost useless, so as to be unable to write. Mr. Glaisher became entirely insensible, and Mr. Coxwell felt that insensibility was coming over himself. Becoming anxious to open the valve he found his hands failed him, and he instantly seized the line between his teeth and pulled the valve open two or three times, until the balloon began to descend. In the course of a few minutes Mr. Glaisher revived, and by the time that he reached the earth the effects of the faintness had entirely disappeared.

Compared with this ærial voyage, all other balloon ascensions sink into insignificance. Guy Lussac attained an elevation of about four miles; Mr. Glaisher, on two occasions, rose considerably above this elevation, and on the last ascent, as already stated, probably attained a height of six miles. Had it not been, moreover, for the presence of Mr. Coxwell, the voyagers would have shot up into an atmosphere so thin that respiration could not have been sustained, and in the end the expansion of gas would probably have burst the balloon, or if the safety valve had been sufficiently large to allow for that expansion, they might have been carried so high into space, as to be numbered among the victims on the altar of science.

TEMPERATURE AT DIFFERENT ALTITUDES.

From a mean of all his observations, Mr. Glaisher presented to the British Association the following table, showing the mean temperature of the air at every five thousand feet of elevation above the level of the sea in each high ascent :

Height above the level of the sea.	MEAN TEMPERATURE OF THE AIR.					Decrease of temperature for an incr'se of height of 5,000 feet.
	July 17.	Aug. 18.	Aug. 21.	Sept. 5.	Mean.	
Feet.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
	61.2	69.6	62.0	62.2	63.8	....
5,000	39.7	48.0	43.3	41.4	43.1	20.7
10,000	28.0	40.7	32.0	31.0	32.9	10.2
15,000	31.0	31.1	20.0	21.0	25.7	7.2
20,000	33.0	25.9	....	10.6	23.2	2.5
25,000	16.3	23.9	....	0.0	13.4	9.8
30,000	....	....	....	−5.3	....	
Decrease of temperature for an increase of height of 25,000 feet	44.9	45.7	....	62.2	50.5	

The results on July 17th are perfectly irregular. Up to 10,000 feet the decrease accords with the other day's experiments, but from 10,000 feet the results are surprising, and continue so up to more than 20,000 feet. The numbers in the last column of the table (the means) show that the average decrease of temperature in the first 5,000 feet, exceed 20 degrees Fah., and in the next 5,000 feet, is but little more than 10 degrees. The numbers in the lowest line of the table show that the average decrease of the temperature for 25,000 feet of elevation, is 50½ degrees Fah., or an average of two degrees to 1,000 feet. From these results it seems that two-fifths of the whole decrease of temperature in five miles, takes place in the first mile, and therefore that the decrement is not uniform with the increments of elevation. The principal results of his observations Mr. Glaisher summed up as follows : "That the temperature of the air does not decrease uniformly with height above the earth's surface, and that consequently more elucidation upon this point is required, particularly in its influence on the laws of refraction. That the humidity or moisture of the atmosphere does decrease with the height with a wonderfully increasing rate, till at height exceeding five miles the amount of aqueous vapor in the atmosphere, is very small indeed." Mr. Glaisher also asserted that observations up to three miles high, or 16,000 feet, even of a delicate nature, can be made as comfortably in a balloon as on the earth; that at heights exceeding four miles, they cannot be made quite so well because of the personal distress of the observer; that at five miles high it requires the exercise of a strong will to make them at all. That up to three miles high any person may go into the car of a balloon who is possessed of an ordinary degree of self-possession.

The results of Messrs. Glaisher and Coxwell's balloon ascent on the 9th of October, 1863, from the Crystal Palace, near London, accompanied by two Americans, are given as follows: "The ascension was made at 4.30 minutes P. M.; at four hours forty-six minutes the height attained was 7,200 feet. They gradually sunk to 1,600 feet, at five hours thirty-six minutes; increased to 8,600 feet at six hours, and then rapidly descended to the earth at 6.40 P. M., being absent two hours and ten minutes. The temperature was 54 degrees Fah. At starting it was at 32 degrees; the freezing point at the height of 5,600 feet; it decreased to 29½ degrees at 7,200 feet; it then increased to 44½ degrees at 1,600 feet, and then decreased to 26 degrees Fah. at 8,600 feet, being a decrease of 28 degrees, or about three degrees for every 1,000 feet. This agrees with other results when rising 8,000 or 10,000 feet from the earth's surface.

MEAN TEMPERATURE OF THE EARTH.

The depth at which the annual changes of temperature disappear varies considerably, not only with latitude but with changes in the nature of soil and rocks in the same place.

Mr. Quetelet, the eminent European physicist, in his recent work "Physique du Globe" gives some interesting statistics illustrative of this fact. Thus this depth is found at Zurich at 83 French feet; Strasburg at 81 feet; Heidelberg, in compact clay, 83 feet; Bonn 72 feet; Paris, in the observatory garden, 68 feet; Leith, England, 55 feet; Edinburgh in trap 55, in sand 66, and in sandstone·96 feet. The mean of these is 73 feet. Only below this mean depth do we encounter the central heat of the earth, which corresponds to about one degree for each forty-eight feet descent, and the effect of which on the diurnal and annual variations above the plane of no variation must be inappreciable.

The above facts satisfactorily account for the cold and hot springs which are found in different parts of the earth's surface. The hot springs rise to surface from a great depth while the fountains or source of the cold springs lay nearer the earth's surface.

The coal mine of Monkwearmouth, England, the deepest coal mine in the world, has a depth of 1,900 feet from the surface, and the working of coal underneath extends to a distance of two miles from the shaft. About three hundred persons are employed in it and six hundred tons are mined daily. The heat at the bottom varies from 84 degrees to 90 degrees Fah., and the miners working in an almost nude state often suffer from extreme heat.

Mr. George Bartlett.—It seems singular, at first sight, that there should be so few facts known with regard to meteorology; but when we reflect upon the number and diversity of the forces that tend to bring about results in this branch of natural philosophy, we can then comprehend the difficulty of arriving at accurate conclusions. On the west side of this continent the controlling forces are fewer and more uniform. In San Francisco, California, during the summer from May to October, there is no rain, and the sudden changes of temperature which we have here are seldom if ever witnessed there. During the summer nights the temperature is very uniform and the mornings are very pleasant, the average temperature of which is about 54° fah.; but about noon the sea breeze sets in when a change takes place and the thermometer falls to near 50°, where it remains for several hours; this makes the afternoons very pleasant; the sea breeze lasts till about sunset. During its continuance, however, there are immense clouds of sand and dust which sport through the streets in such a manner that a clean collar would be completely soiled in an hour. Those who are out doors button up their coats and hurry home. I have seen the thermometer over 100° in the shade, and yet the effects of the sea breeze is such that this heat is not oppressive. The explanation of this is that the land is heated more by the sun than the ocean, which causes the heated air over the land to ascend; the place of this air must be filled from somewhere as the denser and colder air of the ocean flows in which makes the sea breeze. About ten miles from San Francisco, or even on the east side of the bay, this sea breeze fails entirely. There are several valleys scattered along the east side of the bay by which the breeze is tempered, making the most delicious climate in the world. For the purpose of sleep, San Francisco is exceedingly pleasant as the summer nights are cool; never too warm to do without blankets. Farmers sow their barley and wheat in the fall so as to get them started in winter as there is no rain in summer. Another singular feature about San Francisco is that a distance of fifty miles, in any direction from it, brings you into a different climate. In winter the rains are southerly and the winter season generally is very much like our Indian summer. A residence of some five or six years there warrants me in saying that it is the most pleasant climate on earth.

Dr. R. P. Stevens.—The experiments made during the balloon ascents in the vicinity of London, demonstrated what had been partly proven before, that there are different strata of air and that each has a different temperature. In deducing the laws of meteorology, I suppose we have done as much, if not more on the continent of America, than any other portion of the globe. The Canadian meteorologists have been in close communication with those of the United States, and since the Smithsonian institution was founded their observations have been monthly compared. The investigations of Redfield and Hare have demonstrated that all the great storms that pass over the American continent are westwardly; that our northeast storms are but the preceding winds of an immense westerly storm; and that these westerly storms are preceded by a fall in the barometer. Sometimes these storms pass in straight lines and sometimes in curves. Great changes in the temperature are produced by the cold air from the west descending and carrying the moist air before it, which passes along the great mountains of the west and becomes colder by expansion, and when it becomes dry, acts as a non-conductor between the earth and sun, preventing the rays of heat from being absorbed by the ground. The westerly storms are the mighty ones, and from this region, I may safely say, all our great storms invariably come—for whoever heard of a tornado coming from the east? I now speak of hurricanes which sometimes spread a thousand and sometimes only a few miles in width. The great tornado in Arkansas some few years ago, was preceded by a westerly wind, and extended about six rods in width. These storms move in cycloids, and wherever the centre of these cycloids are there the storm will be the most violent. Prof. Espy's theory is that the warm air coming from the tropical regions when moving over the land becomes heated and passes upwards, and meeting with a cold stratum of air it precipitates its moisture in the form of snow or rain, and just in proportion to the rapidity of the ascent and the area of the rising column of heated air, other things being equal, is the extent of the storm; so that if the North American continent was one great plain, the foretelling of a storm and the latitude in which it would prevail, could be easily foretold; but owing to our large rivers, valleys and mountains, our calculations are not so certain. In the village of Hudson, on the Western Reserve, Ohio, when the dew point indicates a rapid evaporation and the fall of the barometer is sudden, the time when a storm would rage on lake Erie could be predicted with great certainty. Often have I seen this done, and so accurate were the calculations that word could be sent across the lake to persons on the other side not to cross; and twenty-four hours after perhaps, a vessel would be blown ashore so violent would be the gale. I could there predict, with the utmost ease, when a great storm was approaching. In this latitude this cannot be done so well, as the counteracting influences are great. We have the Alleghany mountains in Pennsylvania, which lie about eighty miles in a straight line from us, and we have the Highlands in this State, which are some 20 or 30 miles from the ocean These mountains are covered with forests which are 600 feet above the level of the sea; the highest of them are hardly 1,000 feet high. So great an effect have these mountains on an atmosphere loaded with moisture, that in the region beginning on the Delaware river and extending through to the Connecticut river on the north of the Highlands, the climate is the most equable of any on this continent. And from the time of the Dutch settlers to the present, the promise of the Scriptures has never failed. There has always been a "seed time and a harvest;" there has never been a time when the crops could not be raised. In Western New York, at times there have been great droughts—and in 1855 the crops failed; there was no rain south of Milwaukee—and at Cairo, from the first of April to the following October, no rain fell, not enough to moisten the ground. The whole country, from the head of the Wabash river to the Kaskaskia, has been subject to droughts at intervals of five years, and yet this region of country is only some two days' journey by rail from here. These droughts materially interfere with the settlement of this portion of the country, and I suppose that the western part of Kansas cannot be peopled but by nomadic tribes.

"Illuminating gas and its uses," was selected as the subject for the next discussion.

Adjourned.

American Institute Polytechnic Association,
January 21*st*, 1864.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

Mr. Abbott exhibited a small model of his heater and ventilator, by which the carbonic acid gas, or foul air of a room, heavier than the common air, usually falling to the floor, is made to ascend up the chimney. This is effected by forcing the foul air through a furnace, where it becomes rarefied. The moisture of the warm air for heating is regulated by passing it over wet canvas; the surface of this canvas is increased or diminished, according to the dryness of the air, by a hygrometric balance, which causes this canvas to rise or sink in a trough of water, thus exposing a large or small wet surface to the warm air.

The Chairman—In England fireplaces are very extensively used as a means of ventilation, but it is a very expensive practice, as nearly nine-tenths of the heat goes up the chimney. The process here described of heating the foul air, in order to make it ascend the chimney, is an important novelty and worthy of consideration. The plan might be regarded as nearly perfect if the carbonic acid gas did actually remain separate and uncombined with the ordinary air. It has been proved by recent experiments, relating to the osmetic force and the diffusion of gases, that carbonic acid gas will pass *upwards* and hydrogen gas *downwards* to intermingle with other gases. In these cases the force of diffusion overcomes the force of gravity.

Sartain's engraving from Schussele's painting of "Men of Progress," was presented for the inspection of the members. Of the gentlemen represented in the engraving the Chairman made the following remarks:

MEN OF PROGRESS.

The new engraving admirably executed by Sartain from Schussele's fine painting of eminent American inventors is before us to-night, and some notice of the men will not now be inappropriate. First, let me direct your attention to the benign features of the one best known to me, the Rev. Dr. Nott, President of Union College, who has passed his ninetieth year, and has held his present post for nearly sixty years. He was the first to burn anthracite coal successfully in stoves; prominent among his many improvements is the application of the transverse draft, directly above a moveable grate, which made his coal burner self-feeding. He early constructed a steamer for the North river called "The Novelty," which had boilers made up of water tubes, heated by means of hard coal, to which air was furnished by means of fan blowers. He has obtained thirty patents for improvements in heating. Dr. Nott was born in Ashford, Connecticut, in the year 1773.

Prominent in the central part of the engraving is Peter Cooper, born in the city of New York 1791, the founder of the great free institution which bears his name. He has made the larger part of his fortune in the manufacture of glue, isinglass and iron. He has taken out many patents, and was the first to roll wrought iron beams for fire proof buildings.

Joseph Henry, Secretary of the Smithsonian Institution at Washington, was born at Albany, N. Y., in 1797. While professor of mathematics in his native city, he began a series of experiments in electricity, and was the first to construct electro-magnets of great power. One now in the college at Princeton, N. Y., will sustain 3,600 pounds by means of a battery contained within one cubic foot of space. In 1831 he communicated signals, made by means of the electro-magnet, through more than one mile of wire, and thus prepared the way for the complete magnetic telegraph. He has long been ranked as one of the leading savans in America.

Samuel Finley B. Morse was born in Charleston, Mass., in 1791. After graduating at Yale, he studied painting under Benjamin West. While holding the position of a professor in the New York University, he completed his electro-magnetic telegraph. This simple yet important invention consists essentially in causing the motion of a lever in only one direction, produced by means of the electro-magnet, to make a single dot and continuous line upon paper, which is carried forward under the lever by clock work. Thus by means of an alphabet of dots and lines alone, he completed the first and most perfect telegraph ever constructed. He also made the first submarine telegraph, which was tried in New York harbor in 1842.

Joseph Saxton was born in Huntingdon, Penn., in 1799. He is the inventor of many philosophical instruments, the most important being the well known magneto-electric machine, in which electricity is generated from magnets by means of revolving helices.

Thomas Blanchard was born in Sutton, Mass., in 1788. He is a well known inventor. The most important and original of his machines is that for turning irregular forms, first used at the U. S. Springfield Armory for making gun stocks.

Erastus B. Bigelow was born in West Boylston, Mass., in 1814. He stands foremost in the world as the inventor of looms for weaving carpet.

Josiah Jennings was born in Frankford, Conn., in 1782. He died in 1862. His prolific genius brought out many new and useful improvements. The simplest and most important of all was the friction match, which he invented in 1823.

Richard M. Hoe was born in New York in 1812. He is the inventor of the type-revolving press, now indispensable to newspapers having very large circulation. It is in use in London and Paris, as well as in the prominent cities of our own country.

Elias Howe, Jr., was born in Spencer, Mass., in 1819. He was the first inventor of the sewing machine, which, with several essential modifications made by others, has become the most important auxiliary to domestic labor ever constructed.

Charles Goodyear was born in New Haven, Conn., in 1800, and died in 1861. He was the inventor of the combination of sulphur and india rubber at a high heat, forming what is known as the vulcanized rubber, which is probably the most useful artificial substance ever made.

James Bogardus was born in Catskill, N. Y., in 1800. He is the inventor of the ringflyer for cotton spinning; the eccentric mill; the dry gas meter, and the engraving machine. He first constructed, in 1847, complete cast-iron buildings.

Samuel Colt was born in Hartford, Conn , in 1814, and died in 1861. His most important invention was the chamber-revolving pistol, which for each explosion required but one motion of the finger. This was the first practical instrument of the kind ever made.

Cyrus H. McCormick was born in Virginia, and now resides at Chicago, Ill. He is the inventor of one of the reapers in common use, and which received the grand prize medal at the world's fair, London, 1851.

William T. G. Morton was born in 1819. He is identified with one of the most important discoveries ever made, and the successful introduction of anæsthetic agents. A committee appointed by the U. S. House of Representatives, after a laborious investigation, reported that Dr. Morton was the first to apply ether for the purpose of removing and preventing pain. Dr. Wells, of Hartford, had previously used nitrous oxide for that object. Although a patent was issued to Drs. Morton and Charles T. Jackson for the method of using ether, it is claimed that the former is entitled to the credit of furnishing to medical and surgical art this valuable auxiliary.

Frederick E. Sickles was born in New Jersey in 1819. He is best known as the inventor of a cut-off, used principally on ocean steamers having engines, in which steam is used expansively.

Jordan L. Mott was born at Hempstead, L. I., in 1798. He is identified with the early use of very small hard coal (formerly thrown away) as fuel in cooking stoves, and has taken out many patents, chiefly for improvements in the forms of stoves. He is the founder of the village of Mott Haven, adjoining the city of New York on the north.

Henry Burden and John Ericsson are the only two in this collection of inventors who were not born in this country. They are both, however, thoroughly identified with the progress of American mechanism. Mr. Burden was born in Scotland in 1791, and has resided in America since 1819. His most important inventions are the machine for making horseshoes; the railway spike machine, and the eccentric squeezer for making iron blooms.

Mr. Ericsson was born in Sweden in 1803. His most noted novelties are his locomotive, made in England in 1829; his modifications of the screw propeller and the caloric engine; and various improvements in iron-clad vessels of war known as the monitor class.

This engraving does not embrace all our great inventors of the present day. It is hoped that similar works of art will follow, making familiar the faces of those whose genius and perseverance have provided us with labor-saving, time-saving and matter-saving machines, and who, by augmenting material improvements, have contributed vastly to the advancement of civilization.

The Chairman then presented the following interesting scientific memoranda:

ACTION OF COMPRESSED OXYGEN GAS UPON IRON.

Dr. **FRANKLAND** described before the London Chemical Society, Dec. 17th, an accident arising while compressing oxygen gas with Natterer's apparatus, which consists of a powerful force pump worked by a crank and fly-wheel, an iron receiver fitted with a conical screw plug, and other joints and connections of steel. The action of the pump had been maintained until twenty-five atmospheres of oxygen had been accumulated within the receiver, when it exploded, amid a shower of sparks such as are seen when iron or steel is burned in oxygen gas. On examining the fragments, which fortunately did no personal injury, it was apparent that the whole interior surface of the receiver had been blistered and coated with fused globules of magnetic oxide of iron. The small tubular appertures through the screw-plug were widened four-fold, and half an inch of steel was burnt off the massive head of the apparatus. It was estimated that the heat, developed by half of the contained oxygen, uniting with the iron, would have been sufficient to melt the cylinder, which would have been exploded by the remaining pressure of the other half of the gas. It was evident that the fine spray of the lubricating oil was very inflammable in an atmosphere of compressed oxygen, which acted like tinder in causing the combustion of the iron.

A PRIZE OFFERED FOR 1866.

The French academy has offered a prize of 20,000 francs for the best treatise "On the Reproduction of Bone," to be awarded in 1866.

INSPECTION OF STEAM BOILERS.

The London Mechanics' Magazine for December 4, contains an interesting leader upon the importance of inspecting steam boilers, suggested by a single monthly report of the Manchester boiler association, which contains the record of no fewer than 106 defective boilers out of 381 examined, 14 of the defects being of the gravest character and likely to lead to disastrous results. It thus concludes: "Those who employ steam power should recollect that the duration of a boiler is far from being a mere question of time; it depends on so many circumstances that it is impossible to say what may be its condition, without frequent and careful inspection, by those who can form a proper opinion; and every man who makes use of steam-power is guilty of criminal negligence, if he disregards the means of safety which inspection alone can place ready to his hands."

PETROLEUM IN RUSSIA.

An oil producing district has been discovered in Russia. Col. Gowan, an American, who was engaged in raising the sunken fleet at Sebastopol, has obtained a grant of 50,000 acres of land in which he is to make further explorations.

FLAX COTTON MILL.

A flax cotton mill is erected at East Toledo, Ohio, which it is expected will turn out daily 2,000 pounds from 4,900 pounds of raw flax.

OXIDATION OF ALCOHOLS.

BERTHELOT, who made alcohol synthetically by means of olefiant and propylene gases, eight years ago, has been induced to restudy them, and has found, according to his report in the "*Comptes Rendus,*" no difference between ordinary alcohol and that from olefiant gas. There was a characteristic identity in the crystalline form of ethyl-sulphate of baryta, whether derived from common or olefiant gas alcohol. The latter, treated with chromic acid, furnished true aldehyde and acetic acid. On the contrary, propylic alcohol possesses different properties, according to whether it is produced by fermentation or prepared by means of propylene. According to Freidel, alcohol obtained by means of acetone, would represent a third type.

HAMBURG INTERNATIONAL AGRICULTURAL EXHIBITION.

At the recent agricultural exhibition at Hamburg, thirty-four nationalities were represented. Ex-Governor Wright, of Indiana, has made an official report, in which he states that 3,000 machines and farm implements, and 75 steam engines were on exhibition. Although it was apparent that America was ahead in nearly all the farming implements, she was behind in steam ploughing, which he regards as a success.

THE MANUFACTURE OF ILLUMINATING GAS.

The subject for the evening was here taken up, when Dr. John B. Rich, opened the discussion as follows:

As the subject of illuminating gas is a very important one, and particularly so to large communities like our own, I thought a few facts of an his torical nature might not be uninteresting. As early as 1659, Mr. Thomas Shirley suggested that an illuminating material might be had from the burning wells of Wigan, in Lancashire, and to which he called the attention of the scientific world ; and on several occasions he urged the fact that this might be a very valuable discovery, for discovery it was, but no one would take any notice of it. It was again observed by Dr. Clayton, in 1664, that illuminating gas could be made very cheaply by the decomposition of coal by heat, and he said he got this idea from Mr. Shirley. But still there was important improvements to be made in order to render these ideas practical. In 1787, Lord Dundonald, of Culross Abbey, Scotland, occasionally had vessels filled with the gas coming from the burning wells of Wigan, to light up his halls on festive occasions. He afterwards took out a patent for using coal tar for this purpose ; he discovered that a large portion of tar passed off in the form of gas, and the workmen used to light it as it issued from the mouth of the well or cave. But nearly 100 years elapsed before this was made valuable, and the true discoverer of the practical application of coal gas for lighting purposes was Mr. Murdock, a Scotchman, who in the year 1792, at Redruth, in Cornwall, made a series of experiments on the quantity and quality of the gases produced by distillation of different substances, both mineral and vegetable. These experiments were induced by observations on burning coal to test the combustible properties of the gas produced from it, as well as from peat, wood and other inflammable substances, and he was astonished at the great quantity of gas which they afforded, as well as the brilliancy of the lights. He continued these experiments until 1798, when he was appointed to a responsible position in Bolton & Watts' works, in Soho, and from 1792 to 1802, he worked almost alone in this field. In 1802, on the declaration of peace, his employers, Bolton & Watts, allowed him to use it in illuminating their works, which he did very satisfactorily, and as he continued to light up their building for some weeks afterwards, crowds flocked to see it, they even came from distant towns to view the illumination, so novel was the sight.

Much credit however is due to Mr. Winsor, who took out a patent in 1806, and delivered lectures on the subject, and after many efforts succeeded in getting up a joint-stock company, and some of the streets of London were then lighted by gas.

In 1812, Philip Taylor first introduced gas in Paris, and in 1815 erected gas works there, where he manufactured oil gas on a large scale.

The first gas manufactured in this country, was exclusively from oil, and the first street lamp illuminated by it was that before the house of Mr. Legget, the President of the New York Gas Light Company, but subsequently they used rosin, from which they continued to manufacture it for a long time afterwards, as also did the Manhattan Company, until Mr. Roome discovered that it could be made from coal cheaper, and rosin is now entirely abandoned and coal used in its place, and as but half of the coal is destroyed in making the gas, the other half which is coke, is sold, and it is said to nearly pay for the manufacture of the gas itself. There has been many improvements made in the process of generating gas in this city, particularly in the mixing of the different substances. The richest coal, or that which produces the best gas is the bog peat coal ; the coal now most in use for making gas, is the Pennsylvania, but the English coal is preferred. The other coals are in the order of their value, as follows : Pennsylvania, Mount Stirling, Mount Carbon, Beaver Bay. The other coals stand : Cape Breton, Cow Bay, Glase Bay, Lingum Bay.

The Pennsylvania coal cannot be had in sufficient quantities. Recent experiments have shown that a very fine gas can be made from petroleum, but in order to make this process valuable for general use, the petroleum must be sold in this city at five cents a gallon before it can compete with coal gas at all ; that is, if coal is sold at five dollars a ton, petroleum should be at five cents a gallon. Among the improvements which the manufacture of coal gas has undergone is that of using fire clay retorts, instead of the iron ones formerly used, they are also much cheaper, as the iron retorts would cost forty-five dollars, and wear or burn out in eight months, but the clay ones cost twenty-five dollars, and will last three years, and they can be cleaned much more readily. The English companies have lately been using what are termed through-retorts, with doors at both ends, but these have been tried in this country and were not successful, as they had to charge both ends at the same time, and in so doing pieces of carbon would very often fly out in the faces of the men at work charging them. The form of the retorts has also changed. The vertical sections of the first ones were cylindrical, and again oval, they are now in the shape of the letter D, the round side being uppermost. The experiments being made in the manufacture of coal gas, are very numerous. Some companies have the best chemical talent employed in conducting experiments ; one of these chemists is a member of this Institute. The President of one of the companies in this city, told me that more improvements in the manufacture of gas have been made here than in all other parts of the world combined.

Mr. Jireh Bull.—The statement of Dr. Rich, that coal at five dollars a ton was cheaper than petroleum at five cents a gallon, I should say could not be true, if *the quality* of the gas produced was taken into consideration. A small gas manufactory was established at Ballston Spa, N. Y., a few years ago, in which resin was the substance distilled. When owing to the war, resin could not be obtained, resort was had to petroleum, and after altering the burners so as to consume only one-half the amount of gas, the light gave entire satisfaction, and the gas was supplied at the same rates of prices as when resin was used.

The Chairman remarked that the early trials of Murdock and others failed because the gaseous products were not properly combined, and were unpurified. The real introduction of coal gas was when these obstacles were nearly overcome. He proposed to direct attention to the process of distillation of coal and the various products resulting therefrom.

The materials most in use for the manufacture of illuminating gas are coals having a large percentage of hydrogen, oil, resin, peat, wood, and petroleum. Of the latter substance, but little is yet known, and it is impossible to give a clear statement of all the products produced by its distillation. Resin and oil, owing to their present high price, cannot be considered as economical materials. Peat and wood, containing a large percentage of oxygen in proportion to the hydrogen in them, cannot be regarded as available. We therefore turn our attention to coal as the cheapest compound from which to obtain the gases essential to illumination.

The destructive distillation of coal is accomplished by placing it in retorts made of iron or clay and exposing them to a constant and even heat. These retorts are generally recharged every twelve hours. The most rapid process for extracting the gas is to reduce the coal to pieces about the size of corn, and pass them, by means of a hopper and endless web, over a flat surface of wrought iron plate, which is heated from the fires below. By this plan the whole gas is expelled from the coal during its passage across the plate which is accomplished in about fifteen minutes. The complications attending this process are such that it has not come into general use.

The products of distillation by means of the ordinary retort exceed thirty in number, and consist of gases, liquids and solids. They are not, however, separated during the process. All the liquids and some of the solids are dissolved in the gaseous products, yet it would greatly facilitate a clear comprehension of the subject, if we would turn our attention to the several distinct compounds of which the gaseous mixture is composed.

First, and most important among the gaseous products are the hydrocarbons, possessing illuminating power, viz: Olefiant gas, $C_4 H_4$; propylene gas, $C_6 H_6$; butylene gas, $C_8 H_8$. It will be perceived that in these compounds the atoms or equivalents of carbon are in number the same as those of hydrogen. In addition to these gases are the hydro-carbon vapors, having the formula, $C_n H_n$, $C_n H_{n-6}$, $C_n H_{n-12}$. The gaseous products, which may be considered as diluents, are hydrogen, light carburetted hydrogen $C_2 H_4$, and carbonic oxide, $C\ O$. The gaseous products which must be regarded as impurities are carbonic acid $C\ O_2$, sulphuretted hydrogen, $S\ H$, oxygen and nitrogen. The vapors regarded as impurities are bisulphide of carbon and aqueous vapor, $H\ O$. The solid impurities are carbonate of ammonia, $N H_4\ C\ O_3$, sulphite of ammonia, $N H_4\ S\ O_3$, chloride of ammonium, $N\ H_4\ Cl$, and the hydrosulphate of the sulphide of ammonium $N\ H_4\ S + H\ S$. Other substances, such as picoline and aniline, $C_{12} H_7 N$; leucoline, $C_{18} H_8 N$, carbolic acid. $C_{12} H_6 O_2$, are found in the coal-tar residuum. It should be borne in mind that the luminiferous power is stored in the carbon, which, however, requires with it a certain proportion of hydrogen to give it the gaseous form, so that, when the hydro-carbon compound unites with oxygen, in the process of burning, the all-pervading ether or Œth, will be thrown into undulations, thereby producing an effect which we perceive through the visual organs, and distinguish by the name of light. If the hydrogen is in excess as in carburetted hydrogen gas, $C_2 H_4$, the colorific power is not exhibited; so, too, when carbonic oxide gas $C\ O$ is burned and becomes $C\ O_2$, the light generated is scarcely perceptible. On the other hand, if in the hydro-carbon compounds the carbon is in excess, the illuminating power produced by combustion is increased. For this reason small portions of the liquids benzol $C_{12} H_6$, toluol $C_{14} H_8$, cumol $C_{18} H_{12}$, and cymol $C_{20} H_{14}$, add greatly to the brilliancy of the flame. When, however, the relative amount of carbon is still farther increased, as the compound, upon becoming cold, has a solid form, a detrimental effect is produced, by the tendency of such hydro-carbons to condense on their passage to the burner. Thus naphthaline, $C_{20} H_8$, a solid, having only one half the hydrogen found in the turpentine series, emits in the process of coal distillation, a considerable quantity of vapor, causing, to a great degree, the peculiar odor of coal gas, which, as it cools, is gradually condensed and deposited in the street mains. This action causes serious inconvenience, by narrowing the channel of the pipes and preventing the passage of the requisite supply of gas. The only preventive of this evil is to thoroughly cool the gas before it leaves the gasometer, or to pass it over coal oil, which will absorb, to a certain extent, the naphthaline.

In the distillation of coal, the use of too high a degree of heat should be avoided, because the requisite decompositions are best obtained by low temperatures. The effect of too high heat is to abstract the carbon from the hydrogen, giving, as the principal resultants of distillation, carbonic oxide, hydrogen and coke. The use of a low temperature is the chief peculiarity in the process of producing oil from cannel coal.

It is important that the gaseous products should not remain too long exposed to the heat of the retorts. Their passage is expedited and their quality improved by mixing in the current the compounds which result from the decomposition of steam when it is passed over red hot coals.

The purification of the gas is effected chiefly by caustic lime, which absorbs the sulphuretted hydrogen and carbonic acid, forming sulphide of calcium, water, and carbonate of lime.

A mixture of the hydrated peroxide of iron and slaked lime and saw dust, has been substituted in many manufactories in the place of caustic lime. The oxide of iron unites with the sulphur in sulphuretted hydrogen and sulphide of ammonium, while the slaked lime absorbs carbonic acid and carbonate of ammonia, and is converted into the subcarbonate of lime. The object in using saw dust is to make the mixture more porous, thereby allowing it to be more readily penetrated by gaseous products. No substance has been found to arrest the bisulphide of carbon, and probably a certain portion of sulphuretted hydrogen; these compounds are, to a small extent, carried to the burner, and, by combustion, sulphurous acid is produced. This deleterious gas is mixed with the air we breathe when using coal gas, and is the most serious objection to this kind of illumination. As bisulphide of carbon is a resultant of high heat, it seems far more feasible to make the gas at a low temperature, and thus in a great measure prevent the sulphide formation. Sulphur when united with carbon, is the inevitable bane that accompanies all the blessings we enjoy by means of coal gas illumination. The inventor who can devise a plan by which only pure hydrocarbon gases, in proper proportions, will flow into our domiciles for luminiferous uses, will deserve the general gratitude and an ample fortune.

Dr. Rich.—The quality of the gas manufactured in this city varies, but the average of the illuminating power of a four foot burner is equal to the light of fourteen and a half candles, the gas burning at the rate of one cent an hour.

Dr. R. P. Stevens.—In the great law case some few years ago in regard to the so called Albert coal, it was then stated by chemists that about seventy-two different products had been taken from coal by distillation, and the number could be vastly increased. I believe it will be a long time before chemistry will discover precisely the substances in combination with the coal. The reason why the Pennsylvania coal cannot be delivered here in sufficient quantities for making gas, is that it is now so much used on locomotives for generating steam, and for other purposes, that it is very difficult for a cargo to reach this city. There can be no question as to our having in abundance a superior quality of coal for gas making purposes. There can be taken from the Pennsylvania mines a good quality of cannel coal, which is equal to the English coal for making gas.

"The action of the Gulf Stream and Tides," was selected as the subject for the next discussion. Adjourned.

AMERICAN INSTITUTE, POLYTECHNIC ASSOCIATION,
January 28*th*, 1864.

Chairman, S. D. Tillman, Esq.; Secretary, Benj. Garvey.

During the miscellaneous business the Chairman presented the following summary of scientific news:

MUST OF GRAPES.

M. PASTEUR, in a memoir to the French academy of science, states that the sweet or unfermented juice of the grape contains no uncombined oxygen; carbonic acid and nitrogen are the only gases found in it. He proposes to aerate the must, by means of a blower, as the active principle in vinification, considered apart from fermentation, is oxygen. It in fact converts new wine into old, but unless its action is slow, the deleterious result pointed out by Berthelot will be produced. The larger the cask, the longer is the time required for the wine to age. When wine is put in bottles the tendency to aeration is diminished, and in the same proportion its keeping is prolonged.

ARTESIAN MINING.

The Artesian system of boring wells has been applied to horizontal borings into the sides of the Nevada mountains. By means of these adits of the smallest dimensions, rich metallic veins have been discovered at a comparatively trifling cost.

ACETIC FERMENTATION.

M. BLONDEAU, in a memoir to the Academy of Science, on the acetic fermentation and the combustion of alcohol, expresses the opinion that acetic acid, generated as it is under different circumstances, may havs its origin in a variety of causes. There is a special acetic fermentation under the influence of certain microtypes, but it is only when the mycoderms form a sort of membrane that they possess the power of transferring the oxygen required to turn alcohol into acetic acid. This property is inherent in the membranous state, and is not a physiological action. The same effect is produced by paper treated with sulphuric acid, such as is used in the dialyser. This slow combustion, by means of membranous interception, M. Blondeau regards as an important method of chemical research in connection with physiological investigations.

ELECTRIC LIGHT HOUSE.

The light produced by passing an electric current generated by revolving magnets through carbon pencils, is said to penetrate further through fog and mist than that made from oil, owing to the fact, probably, that it is more condensed and intense. It was first applied to a light house in France, and has since been used for a similar purpose in England.

It is not perhaps generally known that the Drummond light, so called, which consists of the flame of oxygen and hydrogen gas, directed on a piece of lime, was not invented by Drummond, but by the late Dr. Hare, of Philadelphia. All that Drummond added was a reflector. The magneto-electric machine used to produce light from carbon pencils, was invented by Mr. Saxton, of Philadelphia.

COBALT COLORS.

A foreign exchange states that the readiest method of obtaining cobalt yellow is to pass hyponitric acid into a solution of nitrate of cobalt containing some potash. By adding more alkali from time to time, the whole cobalt oxide will become cobalt yellow. This method seems to complete the primary colors made by means of cobalt. The protoxide of cobalt is blue, and when melted with powdered glass forms smalt. The hydrated protoxide is red. The sesqui-oxide plus $3H\ O$ when cautiously deprived of its water is black. The oxide intermediate these is of a dark brown color. A sympathetic ink is made by a solution of the nitrate of cobalt. When used on white paper, the characters are invisible in a moist atmosphere, but in dry air they are red. Phosphate of cobalt oxide mixed with moist alumina, and heated, produces the compound known as Thenard's blue. The pigment called Rinmann's green, is a precipitate produced by the action of carbonate of soda upon the sulphates of cobalt and zinc.

ACTION OF LIGHT UPON LEAVES.

According to the assertion of M. Corenuinder, of the French Academy, leaves of *all colors* absorb carbonic acid.

ULTRA-MARINE.

Prof. Hoffmann, in his report upon chemical products in the international exhibition, stated that within the memory of persons now living, ultramarine, manufactured from the Persian *lapis lazuli*, sold for £4, ($20) per ounce. In 1855, there were on the continent of Europe eighty manufactories for making ultra-marine artificially. Most of these are in Germany; but little attention has been paid to the subject in England. The ingredients used are kaolin, sulphate of soda, carbonate of soda, sulphur, charcoal, and colophony.

SILVERING GLASS.

Many persons having followed the published receipts for silvering glass without success, Mr. Joseph Dixon, of this Institute, after making a great number of experiments, presents the following method as always effective if carefully followed: He uses four preparations: 1st. One ounce of white loaf sugar dissolved in twenty-four ounces of *distilled* water; add to this thirty drops of nitric acid, and let it boil one hour, then remove the flask from the fire, add eight ounces of alcohol, and bottle it. 2d. Make a solution consisting of one ounce of caustic soda, and twenty-five ounces of distilled water. Let it settle until clear, but do not filter it. 3d. Make a solution of one ounce of nitrate of silver and ten ounces of distilled water. 4th. Concentrated aqua ammonia. The silvering fluid is made by adding to three ounces of preparation number three, sufficient of number four to re-dissolve the precipitate formed, which will be from one to two ounces, add five ounces of number two, and eight ounces of *distilled* water.

Clean the glass to be silvered, perfectly; the method practiced by photographers is as good as any. Mix for use four ounces of the silvering fluid with two drachms of number one; place the glass in a convenient vessel, and pour in this fluid in sufficient quantity to cover it. Heat the vessel, if large, in a water bath; if small, by holding it over a fire. In a short time the color of the fluid will change to a dark brown, then to a black; when the silver is properly on the glass, little bunches of silver, not deposited, will be seen rolling about, while the liquor will be quite clear. The glass must now be placed in pure water and carefully rinsed, when a brilliant coating of silver will be found over the whole surface.

Light Draft Gun-Boats.

Mr. Norman Wiard, by invitation of the chairman, gave the following description of the gun-boats being built by him for the United States Government:

These boats are light army boats, 160 feet in length and 35 feet broad, and made to draw only thirty inches of water when loaded, and will have a speed of about twelve miles an hour. The guns are furnished with solid carriages, and the boats being double-enders, the pivot guns can be fired from either end. They are also furnished with six launches, and these are armed with a 12-pound rifle-gun. They have in addition to the rifle-gun a field carriage, which, on arriving at a favorable place, can be taken on land. The launches are intended for shallow bays and inlets, where the large gun-boats could not go. Most persons who have travelled on the railroad between Philadelphia and Washington, have noticed that a great portion of the road is built upon trestle work, and not only this road, but several others throughout this country are so constructed. The railroad between Savannah and Charleston is largely built in this manner, so if these gun-boats are run up as far as navigation will permit, then these launches can be made to ascend still further, and if expedient, land the field carriages and destroy the railroad. The guns by which these boats are armed are made of steel, manufactured by myself, as is everything connected with these boats. Engines, guns, harness, are all made at my shops. The guns weigh 780 pounds, and are of 3-inch calibre, and might be called naval howitzers. The engines are high pressure, and there are surface condensers used, which, as far as I have been able to learn, have been entirely successful. One of the objections to surface condensers, particularly in gun-boats, is, that they have to carry a great weight of water in order to be effective; but in these boats I put the tubes on the outside of the boat, and have them to pass along the sides, where they are continually exposed to cold water.

Mr. Geo. Bartlett.—We have spent three evenings here lately listening to a discussion on the armor of the gun-boat Essex, that was clad with an inch of India rubber, over which was placed an inch thick iron plate. I see by an official report, that a trial of this plan has lately been made at Washington. The target was formed of two inches of sheet rubber, and two inches thick of iron plate, which was backed with seven inches of pine, and placed against a bank of solid clay. The gun was placed seventy-four feet from the target, and the ball from an 11-inch gun fired at it which went through the target and sixteen feet into the bank of clay.

OCEAN CURRENTS.

The subject for the evening was here taken up.

Rev. Charles G. Adams, of Manhattanville, read a paper on the origin, extent and operations of the gulf stream, which occupied about an hour. After alluding to the fact that Dr. Franklin first directed attention to the action of the gulf stream, and giving briefly his own and other views as to its origin, he presented an interesting account of the Antarctic current, which moves from the south into the Indian ocean, passes between Madagascar and the eastern coast of Africa, doubles the Cape of Good Hope, moves northward along the coast of Guinea, afterwards unites with currents from the north, and moves westward on the equator until it reaches the American continent, where it separates into two streams, one passing southward and the other northward. After receiving the waters of the Amazon and Orinoco, the north stream enters the Gulf of Mexico, and, making a complete circuit, emerges between the Keys of Florida and Cuba, and again moves northward. The reverend gentleman stated that he had resided for a long time in Florida, and had daily watched the action of the stream, noted its high temperature, and observed the vast deposits thrown up by it. After relating his personal observations, he proceeded to give his theory of the action of ocean currents, which differs widely from the opinions of eminent geologists, in making these currents the principal cause of the formation of islands and continents. His remarks were listened to with respectful attention by many who could not accept his deductions, and at the close he received general applause.

Mr. Nash followed, giving some geological objections to the theory of the lecturer. Prof. Everett and Dr. Parmelee took exception to some chemical statements. Mr. Enos Stevens did not believe the rotation of the earth was the cause of the equatorial currents, and alluded to the demonstrations of Laplace upon this subject.

The Chairman remarked that this association desired facts more than theories. The phenomena relating to ocean currents, presented by the lecturer, are of very great interest, and in this connection he would allude to the observations of the equatorial current of the Pacific, made by Lieut. Bent, U. S. N., several years since. There is a vast movement of waters extending from the Tropic of Cancer, on the north, to Capricorn, nearly 3,000 miles. It sweeps westward until it is split into innumerable streams by the Polynesian Islands. One of these streams moves northward along the east coast of Formosa and Japan to the chain of islands south of the Gulf of Yeddo, where it has a velocity of about 80 miles a day. This stream is called the Kuro-Siroo, and corresponds to our gulf stream. Between Formosa and the Majico-Sima islands its width is about 100 miles. It expands until opposite the Loo-Choo and Bonin islands, where it is about 500 miles wide. It sets to the eastward, and its warm influence extends to the northwest coast of North America, favorably affecting the climate, as the gulf stream does that of the western coast of Europe. The subject of ocean currents is one of profound interest. For nearly all our knowledge of the minor currents on the Atlantic coast, we are indebted to the Coast Survey, under the direction of Prof. Bache.

On motion of Dr. J. B. Rich, an unanimous vote of thanks was passed to Rev. Mr. Adams, after which "Waves and Tidal Forces, and their Useful Application," was selected as the subject for the next meeting on February 11th. Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
February 11*th*, 1864.

Chairman, S. D. Tillman, Esq.; Secretary, B. Garvey.

NEW TOMPION FOR GUNS.

Mr. Garvey presented an improved tompion; it contains a ring of India-rubber, which by the pressure of a screw in the center of the instrument, was expanded so as to fit tightly into the bore of a gun.

Mr. Wiard said he had seen a tompion used for artillery purposes resembling this.

Dr. Rowell stated this application of rubber by means of a screw to make a tight fit has been used in a certain kind of preserve jars.

The Chairman remarked that the same principle, without the use of rubber, has been applied to the metallic packing of the piston of a steam engine. By turning a screw at the center the piston, without being removed, is brought to a steam-tight fit with the cylinder.

STEAM-BOILER EXPLOSIONS.

Mr. John B. Root stated that as far as his own knowledge as an engineer extended, upright boilers with upright smoke-tubes were not so liable to explode as those lying horizontally. He wished to gather facts relating to this point.

Messrs. Wiard, Dibben, Rowell, and Miller respectively cited cases of the explosion of upright boilers.

The Chairman presented the following summary of scientific news:

OCCULT POISONS.

According to the investigations of Prof. Letheby of London, nitro-benzole and aniline, in their free state, are powerful narcotic poisons. Their insidious action should be thoroughly understood by all persons engaged in the manufacture of mauve, magenta, and other aniline coloring compounds.

The fact that nitro-benzole may remain in the human body a long time before manifesting any action, and that after exerting its fatal effect, it is so changed as to leave but slight traces of its presence, should attract the particular attention of the medical jurist and analytical chemist.

The Weather and Weather Prophets.

Sir John F. W. Herschel has an interesting article with this title in the January number of *Good Words*, from which this single paragraph is extracted: "If we are ever to make any material progress in the prediction of the weather beyond 'forecasts' of a few hours, or it may be a whole day in advance, it can only be by the continued study of such of its phases as recur periodically or of such as manifest a periodicity of events, as distinct from that of times and seasons, with a view to connecting them with their efficent physical cause. Of this latter description we have an example of one, and of its successful reduction under the domain of philosophical reasoning, in the law of the rotation of the winds. That the winds in their changes, in the general way 'follow the sun'—*i. e.*, have a tendency to veer in the same direction round the compass card with the sun's apparent diurnal course in the heavens (from east round by south, west, and north in northern hemisphere, and reversedly in the southern) in continual succession back to the orginal point—has been surmised from very early times, but until lately, rather as a matter of occasional remark, agreeing on the whole with the general impression of casual observers, than as a meteorological law of universal applicability.

"As such, however, it has now taken its place among ascertained facts, verified by the registered movements of the wind-vane at every station where continuous observation is made, and connected by the researches of M. Dove with that great fact which underlies so many other phenomena —the rotation of the earth on its axis."

Electricity in Asthma.

M. Poggioli reports to the French Academy that the true asthma a nervous disorder of the respiratory organs, has been successfully treated by electricity.

Typhoid Fever.

Prof. Sigri in a memoir to the French Academy states that the infusoria, Bacteriums, were found in the blood of a man who died of this disease at the hospital of Sienna.

A Parasitic Pestilence.

Mr. Van Rudolf Leuchart states that one-sixth of the annual deaths among the people of Iceland is solely owing to a little entozoon living in the dog, from which the larva is generated, which, if kept in an imperfectly developed condition, grows to an immense size. These larvæ infest both men and cattle.

New Hydrate of Lime.

Dr. John Davy has published some experiments on the slacking of quick lime which seem to warrant the conclusion that water is capable of uniting feebly with less lime than is required to form a hydrate of one to one, the weaker compound being probably two of lime to one of water.

SIRIUS AND ITS COMPANION.

The light of Sirius, according to the calculations of Sir John Herschel, is 224 times greater than that of the sun, its parallax being 23-100ths of a second, its distance from the earth is 52,000,000,000,000 of leagues, and its light is about twenty-two years in reaching us.

Some irregularity in its motions have induced the suggestion that it was influenced by a star companion. Such a star was discovered by Alvah Clark, the celebrated optician and observer of Cambridge, Mass., January 31, 1862. The January number of *The Edinburgh New Philosophical Journal* for 1864, contains an interesting communication from Mr. T. H. Safford, assistant at the observatory of Harvard College, in relations to the motions of the companion of Sirius, in which the observations of Bond of Cambridge, Rutherford of New York, and several European astronomers are cited, in relation to the queries whether the new star is unconnected with Sirius, or a satellite, or the disturbing body. He thus concludes: "It is consequently highly probable that the disturbing body has actually been found; that what was predicted by theory has been confirmed by sight. The importance of continued observations cannot be too highly felt. The companion of Sirius must be measured for the coming year, and for several years, while Sirius itself should be re-observed with meridian instruments."

A NEW DEVELOPER.

At the February meeting of the American Photographical Society, held at the New York University, Mr. Duchochois described his new developer, which consists in combining constituents previously used in photography in the following manner: Sulphate of the protoxide of iron, 480 grains; water, 17 fluid ounces. After complete solution a drachm of aqua ammonia fortis is added. By decomposition a double sulphate is formed, oxyde of iron is precipitated, and afterward converted into acetate by addition of acetic acid in excess (three fluid ounces No. 8). The collodion must be that which gives little intensity and great sensitiveness, and the other materials used be absolutely pure to avoid fogging. Under these conditions the most perfect negatives, are obtained in a time excessively shortened.

Mr. Crum, a practical photographer, presented fine pictures made with the new developer, and stated that the time of exposure was shortened one-half.

PAPER NEGATIVES.

At the same meeting Mr. H. J. Newton exhibited specimens of paper negatives, prepared by him with gum benzoin dissolved in alcohol. By Mr. Newton's process the grain of the paper is no longer visible. Photographs made from these negatives, were also exhibited and greatly admired.

TIDE WAVES AND WIND WAVES.

The regular subject for discussion, "Wave and Tidal Movements," and their useful applications by merchanism, was then taken up. The following remarks were made by the Chairman :

The profound Kepler was the first to explain, in a general way, the cause of tides. By intuition, apparently unconnected with his deduction from his third grand celestial law, he proclaimed "that all bodies attract each other; the waters of the ocean are held in their bed by the earth, but are elevated under the moon and on the opposite side of the earth because the earth is less attracted by the moon than nearer waters, but more than the waters on the opposite side." The mathematical demonstration that the power of the moon and sun, in this respect, is in accordance with the law of gravitation, was the work of Newton; but his equilibrium theory could not be satisfactorily applied to all the phenomena observed. It was left for Laplace, in his treatise on Celestial Mechanics, to explain definitely the many apparently discordant movements of the sea by what is known as the dynamical theory of tides, in which the laws of hydrodynamics have an important application. The cubic measure of the ocean is estimated at 788 millions of cubic miles, and taking the density as found two miles below the surface as the mean, its weight is about 1-1786th of that of the whole globe. Although the sun is 355,000 times heavier than the earth, yet at the distance of 90,000,000 of miles, its influence upon the ocean is far less than that of the body only 1-75th of the weight of the earth acting at a distance of 240,000 miles. The mass of the sun is more than 26,500,000 times greater than that of the moon, but being 396 times her distance from the earth, the height of the tidal wave produced by it, compared with that raised by the moon, is as 38 to 100. When these two attracting bodies are in conjunction, or are on opposite sides of the earth, their joint action produces the highest water, called the Spring tides. When the moon is in its quadratures, that is 90° from the points of conjunction or opposition, its lowest effect is at the point of the highest effect of the sun, and their joint tide—the difference of the separate ones—is called the Neap tide. The rise and fall of Spring and Neap tides are nearly as seven to three. The action of either luminary consists in the difference of the attractive force exerted by it on the solid core of the earth and its covering, the ocean, and the effect is to form two waves on opposite sides of the earth. Were there a continuous sea on the line of the Equator, the great tidal or primary wave would move at the rate of about 1,050 statute miles per hour, but as the sea is broken up into three great basins, and their only connection of note being southward of the continent, the tidal movements are complicated, and greatly diminished in velocity. In each basin the waves must start anew from the eastern shore, but in the southern sea the circular course is unimpeded. It also spreads across the three great basins diagonally, so as to overtake and commingle with the tidal wave proper. These commingling waves, the regular currents of the ocean, its varying depths, the shape of its shores and estuaries, are causes of perplexity in tidal calculatians. Yet, through all, it may be perceived that there is a tide corresponding in its semi-diurnal rise and fall with the lunar day of twenty-four hours and fifty-four minutes.

For a detailed description of the tides on our Atlantic coast, in the Gulf of Mexico and in the Pacific Ocean, reference should be had to the reports of the United States Coast Survey. These annual quartos contain a vast fund of information, which seems to be providentially provided for the use of our navy, when it is charged with the duty of guarding a great extent of coast. The phenomenon of the meeting of the tide waves occurs daily in our own vicinity. The tide, which is nearly simultaneous along the main headlands of our Atlantic coast, enters at Montauk Point and Sandy Hook. In about three and a half hours the waves meet at or near Throgg's Neck, one having traveled through Long Island Sound 120 miles, and the other through the East river about 40 miles. The dividing of the waves from Sandy Hook, at the junction of the North and East rivers, the narrow channel and the natural obstructions at Hell Gate, will account for its tardy movement.

The range or rise and fall of the spring tide at important points is as follows: At Havre, France, 22 feet; at London, 19½; at Liverpool, 26; at Bristol (King Road), 44; at St. John, N. B., 23; at Sackville, N. B., 30; at Quebec, 18; at Portland, 9.9; at Boston, 11.3; at New Haven, 6.2; at New York, 5.4; West Point, 3.2; Albany, 2.5; Philadelphia, 6.8; Baltimore, 1.5; Washington, 3.4; Charleston, 6. A little less than one-half of each of these sums would respectively express the range of the neap tide.

The declination of the moon has an important relation to the periodical decrease in the height of the tide wave.

It will be readily perceived the waters cannot instantly respond to the power of the moon, and there is consequently a *lagging* of the great primary wave.

One of the deductions of Dr. Mayer, in his essay "On Celestial Dynamics," is thus aptly presented by Prof. Tyndall in his work on "Heat as a Mode of Motion:" "Standing upon one of the London bridges we observe the current of the Thames reversed, and the water poured upward twice a day. The water thus moved rubs against the river bed and sides, and heat is the consequence of friction. The heat thus generated is, in part, radiated into space, and there lost as far as the earth is concerned. What is it that supplies this incessant loss? The earth's rotation. Let us look a little more closely at this matter. Imagine the moon fixed and the earth turning like a wheel from west to east in its diurnal rotation. A mountain on the earth's surface, on approaching the moon's meridian, is, as it were, laid hold of by the moon; it forms a kind of handle by which the earth is pulled more quickly round. But when the meridian is passed, the pull of the mountain would be in the opposite direction; it now tends to diminish the velocity of rotation as much as it was previously to augment it, and thus the action of all fixed bodies on the earth's surface is neutralized.

But suppose the mountain to lie always to the east of the moon's meridian, the pull then would always be exerted against the earth's rotation, the velocity of which would be diminished in a degree corresponding to the strength of the pull. *The tidal wave occupies this position*—it lies always east of the moon's meridian. The waters of the ocean are in part dragged as a brake along the surface of the earth, and as a brake they must diminish the velocity of the earth's rotation. The diminution, though inevitable, is, however, too small to make itself felt within the period over which observations of the subject extend."

USEFUL APPLICATION OF TIDAL POWER.

The tide is used to register its own movements. The self-registering tide-gauge, used in the United States coast survey, was constructed by the well known American inventor, Joseph Saxton. A full description of this instrument may be found in the Coast Survey Report for 1853. The importance of this instrument in recording an unusual action of the ocean will be appreciated by citing a single case. On the 23d and 25th of December, 1854, the tide-gauge at San Diego, registered unusual curves, which were noticed by Lieut. Trowbridge, of the coast survey, and in communicating this fact to Prof. Bache, he added, "there is every reason to presume that the effect was caused by a submarine earthquake." No shock had been felt along the Pacific coast. On the 20th of June following, accounts were received in this city of a violent earthquake at Japan, by which the Russian frigate Diana, in the port of Simoda, was so injured as to be rendered useless.

Letters from Japan gave the time at which these shocks occurred; one of these claimed to be an extract from the log-book of the Diana. From these statements and the curves registered both at San Diego and San Francisco, Prof. Bache calculated the rate of motion of the earthquake waves were at from 355 to 370 miles per hour, and the length of the waves on the San Diego path, at from 182 to 192 miles; that on the San Francisco path, at 210 to 217 miles. The average depth of the ocean on the San Francisco path was also calculated, from the length and rapidity of the wave, to be 2,500 fathoms; that on the San Diego path at 2,100 fathoms. The waves thus measured by Prof. Bache, produced by the heaving of the earth, form a third class which may be distinguished as waves of displacement.

The most important application of the tidal power is for the movement of various kinds of machinery used in the arts. Mills thus driven derive their power indirectly from the moon, while all other water-mills depend on the fall of water which has been elevated by the sun in the process of evaporation.

Water, as used at natural and artificial waterfalls for driving mill-wheels, is, without doubt, our cheapest motor. The tide mill is not very efficient because its power is never great and cannot act continuously. In conclusion, the Chairman invited those present to give brief descriptions of tide mills that had come under their observation. The only one, now in his memory, was at Stamford, Conn., on Long Island sound. It was originally used as a flouring mill, but afterwards for grinding drugs and condiments.

Mr. Dibben said there were, to his knowledge, several tide mills on Long Island, and one on Staten Island. Many present may remember the old Gowanus bay, now filled up and forming part of the city of Brooklyn. As late as 1846, this was the pond of a tide mill belonging to one of our prominent citizens and used for grinding dye stuffs. There are several kinds of wheels used in tide mills—that called a current wheel is used in some of the rapid streams at the west.

Dr. Rowell alluded to the arrangement of some tide wheels which caused them to run in the same direction whether the tide was running in or out.

Mr. Norman Wiard said he had constructed such a wheel and would illustrate its peculiarities by a drawing on the blackboard. The wheel moved horizontally; each paddle was hung on pivots near the middle so that the direct pressure of the water being greater on one side of the pivots than on the other, would tend to keep the paddle open that is in line of the radius. When the water was directed to one side of this wheel, its effect was to open the full paddle to receive its force, but as the paddle commenced its return with the rotation of the wheel being pressed equally on both sides, it moved edgewise through the water to the point where it was again thrown into the radial line by pressure only on one side. In the course of his remarks upon the action of tide wheels, he related a singular occurrence on a small steamer under his charge, anchored off the battery not long since. During the day the pumps had been used. In the night the paddle wheels were put in motion by the tide. When morning came, 12 inches of water was found in the hold and the water tanks were filled with salt water. Mr. W. then directed attention to the attempts which had been made to use the force of waves produced by wind, for propelling vessels; and described the jointed ship called "the Bender," in which the motion of part of the ship was expected to operate machinery.

Mr. Fisher said he had read this in the Scientific American some time since, and he remembered another abortive attempt to make waves move fins on the outside of a vessel. The smallest steam engine ever put into a boat would be more effective than either of these plans.

Mr. Dibben said the plan alluded to was copied by the Scientific American from the London Mechanics' Magazine, and the credit (if any) was due to England.

Mr. Root and Mr. Garvey joined in condemning the proposed plans.

The Chairman remarked that the highest waves seen on the Atlantic ocean did not exceed thirty feet. In the Southern ocean, which is very deep and unobstructed by islands, the waves are higher. Off Cape of Good Hope some were estimated to have an elevation of 40 feet. A wave form travels its own length in the time of two oscillations; and the time of an oscillation is proportional to square root of the wave length.

Mr. Enos Stevens returned to the subject of tides, and explained at length the effect of the moon's declination upon the tides in high latitudes. After which "The Use of Compressed Air as a Motor," was selected for discussion at the next meeting.

Adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
February 18*th*, 1864.

Chairman, S. D. Tillman, Esq.; Secretary, Mr. B. Garvey.

WATER ENGINE.

The miscellaneous business commenced with the examination of Eames' new water engine, patented in 1862, especially designed for the factory and the farm, to force a small stream of water to any height required by means of a larger stream. It is claimed that it will do much more duty than the common hydraulic ram under the same head. The principle applied in this engine is the pressure of water, acting directly upon a reciprocating double-acting piston, working in a horizontal cylinder, which moves two smaller pistons in brass cylinders on either side of the large ones. The small pistons alternately force the water through two valves into an air-chamber, and from thence by a small pipe to the point where it is to be used. Directly under the main cylinder is the chest in which are the valves regulating the admission and discharge of water, which are directed in their action by levers at each end moved by the main piston. The machine exhibited was about twenty inches long and twenty inches high, including the air-chamber. The diameter of the driving piston is six inches, and that of the forcing piston two inches, the ratio of area being as nine to one. The machine is automatic, and when once put in operation under a sufficient head, near a spring or brook, and properly protected from the frost, will continue to furnish water until the pistons require re-packing. One of these engines was put in motion in the basement of the Cooper Union building, and was there examined by many members after the adjournment. It was regarded as a very compact and complete machine.

The Chairman then read the following summary of scientific news:

PERIODICITY OF EARTHQUAKES.

The influence of the moon upon the fluid covering of the globe having been fully discussed at our last meeting, we may appropriately pass from the tidal wave to the seismic wave, and briefly allude to the effect of our satellite upon the fluid nucleus beneath the solid crust of the earth. Prof. A. Perrey, of Dijon, France, affirms "that there is a periodicity as to times of occurrence in earthquakes as in other cosmical and meteorological phenomena. When earthquakes, through a long period, are grouped with reference to the moon's age, two maxima and two minima of frequency may be distinguished in each lunar month, the maxima following immediately the syzygies, and the minima corresponding to the quadratures. When, again, they are grouped with reference to the passage of the moon over the meridian, there are two analogous maxima and two minima; the maxima corresponding to the passage of the superior and inferior meridian, and the minima to the intermediate times. These laws, based, one on a comparison of more than 6,000 days of earthquakes, and the other on 1,000 of earthquake shocks, show that there is a relation between the frequency of earthquakes and the rotation of the moon." The evidence that this relation is one of cause and effect is presented in the leading article of the January number of *Silliman's American Journal of Science and Art.*

POROSITY OF CAST STEEL.

Mr. Deville has given to the Chemical Society of Paris the results of some experiments made by him in connection with Mr. Troost, which prove that cast steel is capable of being penetrated by hydrogen when at a high temperature. He also cited several cases in which heated bodies absorb hydrogen and expel it on cooling.

IMPROVEMENT OF STEEL.

This subject is still attracting the attention of several scientific experimentists. Some months since a memoir appeared from M. Le General Sobrero, of Turin, on the constitution of iron, cast iron and steel, in which he denies that the nitrogen of the nitrogenized carbon compounds used in making steel is an essential element in its constitution, but maintains that to insure goodness and durability to steel and resistance to successive heatings, it must contain a metallic oxide difficult of reduction and capable of solution in the steely mass, as the sub-oxide of copper dissolves in copper. This property is attributed by him to the oxides of manganese, titanium and tungsten. Very recent experiments tend to prove the beneficial effect of the presence of small quantities of either of these metals. Those made by Caron, by order of the French Minister of War, show that tungsten added in small quantities to both cast iron and steel increases their hardness and tenacity. Mr. E. Riley, in a paper on the occurrence of titanium in pig iron, and the use of titaniferous minerals in the manufacture of iron and steel, read before the last meeting of the British Association, says that titanium appears to have some beneficial effect in the manufacture of iron and steel, and to act somewhat similarly to manganese.

A THALLIUM ALUM.

Mr. Nickles announces that he has obtained an alum, in which thallia is substituted for potassa and sesqui-oxide of iron for alumina, to which is added the usual twenty-four equivalents of water.

THE SPECTRUM TEST.

The same scientist does not find the characteristic green line of thallium spectrum in the spectra of some of the thallium compounds.

ANILINE COLORS.

Mr. J. W. Young states in *The London Chemical News* that, by adding wheaten starch to manure, magenta, &c., the coloring matter is absorbed and the supernatant liquor is rendered nearly colorless. Most of the coloring matter may be removed from the starch by alcohol.

DIRECT AND DIFFUSED LIGHT.

Prof. Bechi of the Technic Institute of Florence has made some experiments in relation to the action of direct and diffused light upon the growth of plants. The analysis of plants of the bean tribe, raised under these differing conditions, show that more than double the quantity of carbon, hydrogen, oxygen and nitrogen, is found in plants exposed to direct light, while those shielded from it contain an increased amount of water. These experiments confirm what practice has taught the farmer ; that grass and other plants grown in fields where shade-trees abound are less nourishing than those which have received the full power of sunlight.

TREATMENT OF INDIA-RUBBER.

Prof. Everett read an extract from a German periodical, *Dingler's Polytechnic Journal* for October, 1863, in commendation of an American invention. Dr. Parmelee's process for the treatment of India-rubber with bisulphide of carbon. It thus states its advantages: "The transformation of the India-rubber is done in a few minutes, and the product possesses beside the known qualities of vulcanized rubber, a lighter color whereby it is more apt for a reception of colors than the common vulcanized rubber, which must first receive a lighter shade by adding white substances, such as the oxide of zinc and the like."

The Chairman directed attention again to statements regarding the improvement of iron and steel. Our vast melting operations having given the subject additional interest.

Mr. Dibben remarked that this Association was the first to draw public attention to the fact that our common iron was greatly improved in quality by the admixture of a small quantity of Franklinite which contains manganese. The demand for the New Jersey Franklinite has greatly increased, and orders for it have been received from Europe. Eight out of ten of all the chilled car-wheels used in this country are made by this process.

Mr. Wiard stated that he had melted 1,200 lbs. of Springfield iron with 100 lbs. of Franklinite iron and found that the tensile strength was 36,000 lbs.

THE USE OF COMPRESSED AIR AS A MOTOR.

The discussion was opened by Mr. Root, who alluded to the manner in which air had been compressed by heat and used in the Caloric engine, and to several cases when it had been compressed by force and thus used for transmitting power. He adverted to the fact that air, like all gases emits heat on compression, and absorbs it on expansion. The manner in which the vapor of water and air unite and separate in the sky had suggested to him the use of an engine, which he then described by the aid of a diagram on the blackboard.

Messrs. Dibben and Bartlett explained its impracticability.

The Chairman remarked that within the last ten years more novel motors have been tried in this country than any other. No one should now enter this field without having first carefully studied the elements of caloric engines, Mt. Storms' Cloud Engine, Drake's Ignition Gas Engine, Blanchard's Steam and Gas Engines, and Hughes's Bi-Sulphide of Carbon Engine. It would, however, be interesting to examine air as a secondary motor; and in this connection, the plan of Richardson, of Boston, for carrying letters and small packages through tubes by pneumatic power, which is now said to be in successful operation in London.

Thereupon Mr. Garvey, the Secretary, read from the London Mechanics' Magazine a full description of that method, and added that he had been upon the atmospheric railways formerly in use to a very limited extent in Ireland and England. The reason for their entire failure was the difficulty experienced in keeping the apparatus air-tight, and the increased cost of carrying passengers. The locomotive has taken the place of the pneumatic engine on these roads. He also alluded to a successful use of air as a medium of power in the tunnel now being constructed under the Alps. The prime mover was the waterfall on the mountain side, and the air compressed was liberated in such manner as to ventilate the tunnel at the same time it performed the duty of drilling.

Dr. Rowell explained by the aid of a diagram the manner in which air was used to clean grain in Hecker's Metropolitan Mills, where it was found much easier to draw the air than to force it through tubes. The temperature was reduced 5° within the tubes.

Mr. J. A. Miller read the following paper:

On the Use of Heated Air Slightly Compressed.

Compressed air as a motive power is certainly useful in localities where steam or water power cannot be employed, as in mines and tunnels; but this question of compressed air as a motive power has a far wider field than has yet been examined. Taking *calo potentia est* as an ascertained truth we must admit that the loss of heat is the loss of power. Now without going through the minutiæ of a calculation I will simply state, that by careful experiments and calculations, it has been ascertained that in a puddling furnace with a stack thirty-five feet in height, 500 pounds of coal are required to move a certain quantity of air by rarefaction, at sufficient velocity to ensure combustion; whereas one pound of coal expended in a Cornish boiler will by the power of steam, employed through the medium of a fan blower, supply the same quantity of air to the fuel during the same time. The same proportions exist in our steam boiler furnaces, and as fuel forms the standard of cost for all steam power, it must be apparent that a large saving is effected by the use of compressed air in a proper manner; as a motive power it will be at once the simplest and most effective application. It must be also apparent that whatever heat once generated which might be used for other purposes is most prodigally wasted when allowed to escape through a chimney. If compressed air were forced through pipes in our streets there would be no further use for the tall and costly chimney stacks which now disfigure our factories. But besides this a saving of at least fifty per cent of fuel would be effected; this is an immense item. If by some means every chimney in our land could be destroyed and compressed air be properly introduced into our furnaces, and all chambers of combustion, the saving effected would pay the full interest on our National debt and provide an ample sinking fund for its early redemption. So much as to compressed air as a motive power.

But, Mr. Chairman, this question of compressed air is of such magnitude and importance that all other questions become secondary when compared with it. Light, heat and water are necessities without which no human or even brute being can exist for but a short time, and yet for a time they may be dispensed with; but air is the very breath of life without which no being can exist. Now the pure atmosphere consists of one volume of oxygen and four of nitrogen, and as oxygen is the life giving principle, the very supporter of life, it is evident that the purer the air and the more compressed its volume the more oxygen is inhaled by each operation of breathing, and as a consequence the deeper, less frequent and less painful the inhaling to those suffering from lung diseases, whose number is legion, as well as more invigorating to those in the enjoyment of health.

The celebrated French author, M. Junot, says, on this subject:—

"When a person is placed in condensed air, he breathes with increased facility, and feels as if the capacity of his lungs was enlarged; his respirations become deeper and less frequent; he experiences, in the course of a short time, an agreeable glow in his chest, as if the pulmonary cells were becoming dilated with an elastic spirit, while the whole frame receives at each inspiration a fresh vital impulse. The functions of the brain get excited, the imagination becomes vivid, and the ideas flow with a delightful facility, digestion becomes more active, as after gentle exercise in the air, because the secreting organs participate immediately in the increased energy of the arterial system."

The habit of excluding fresh air is fostered by the craving for warmth, and the deficiency of our heating appliances to keep up the necessary warmth, allowing a free circulation of fresh air.

As fuel to the poor is a very expensive item, it is not to be expected that they would sacrifice heat for ventilation, of the necessity of which they are mostly ignorant, but it is to be hoped that the necessity for the building of model houses for the poor and working classes will in time be found out, when they may enjoy the luxury of fresh air with the exclusion of cold in addition to cleanliness, pure water and light.

If compressed air were furnished us as gas and water now are, there could be nothing simpler than the heating of our dwellings by heating the compressed air in a furnace in the cellar to any temperature required and then passing it through pipes surrounded by the products of combustion to retain the temperature required. The air by passing through the registers into the room would heat it equally, being under pressure and without the possibility of local draft, at the same time giving a delightful freshness and elasticity to the atmosphere, resembling that of the open, calm air. In this way whole blocks of buildings might be heated by one or more furnaces specially constructed and attended by one person, saving immensely in fuel as well as in care and cleanliness. But above all, in summer, when the thermometer indicates a temperature often exceeding 100 degrees, the pure atmospheric air, cooled by passing from some elevated suburban spot through pipes lain in the ground, would so much reduce the temperature of our rooms, our schools, churches and hospitals, as would preclude the necessity of sending our families into the country or to sea shore watering places.

Light, another necessity, also depends on compressed air; it requires ten cubic feet of pure atmospheric air to supply two cubic feet of oxygen, to effect the combustion of one cubic foot of coal gas; but if the air does not contain the two cubic feet of oxygen for ten feet, part of the gas must pass off unconsumed. Also by taking heated compressed air through hydro-carbon, a good light can be obtained at a much lower price than is charged by gas monopolies. In short, compressed air, when once introduced, will be used for an endless variety of purposes besides those named above, as for melting and soldering where the blow-pipe is used, for boiling and cooking with common gas, for drying purposes, in laundries, dyers' works, cloth, paper, hall oil cloth, India rubber works, carriage manufacturers, chemical works, cabinet makers, and many others.

The greatest and most enduring monuments that men have erected to perpetuate their names, are the great water-works which supply large cities with this necessary element. But he who will supply our large cities with pure compressed air, will confer a more lasting favor even than those who furnished the water; the whole social, commercial and manufacturing system will be improved, and health, comfort and longevity will be the blessings bestowed on the present generation, while the children instead of taxing their poor weak brains in badly ventilated and worse heated school houses, will enjoy the pure country air whilst they improve the better facilities offered in cities for education. If our efforts could hasten the time when all this will be accomplished by but one year, we would feel amply compensated by the consciousness of having saved hundreds of human beings from an untimely grave.

The Chairman briefly commented on the law of Mariotte, that the pressure of an elastic fluid, at a constant temperature, varies inversely as the space it occupies, and directly as the density.

"The necessity of a reform in our weights and measures," was selected as the subject for the next discussion.

Adjourned.

American Institute Polytechnic Association,
March 3*d*, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

After some desultory conversation on the value of an invention which is to be subjected to further test, the Chairman presented the following summary of scientific news:

New Explosive Compound.

If glycerine, a liquid obtained from fats, is treated with nitric and sulphuric acid as cotton is treated to produce gun-cotton, the product when heated explodes with great violence. This compound has not been applied to any useful purpose. It is a powerful poison, one drop taken into the human stomach being sufficient to produce death.

The Chairman remarked that as glycerine may yet be applied in many branches of the arts, it would be proper to examine its chemical characteristics. It is a sweetish liquid composed of six equivalents of carbon, eight of hydrogen, and six of oxygen. As grape sugar consists of twelve of carbon, twelve of hydrogen, and twelve of oxygen, it will be seen that glycerine has half the number of equivalents of each element, plus two of hydrogen. It is a base which, combined with three equivalents of acid, forms the neutral fats olein, stearin, margarin, palmatin, &c. These, when united with soda or potash, saponify; the acid unites with the alkali, forming soap, while the weaker base, glycerine, is set free. In many of our large soap-making establishments the glycerine is not saved or applied to any useful purpose.

Mr. John E. Gavit stated that it was now manufactured largely in Philadelphia. It has been found very useful when mixed with glue for printers' rollers. He had also used it instead of soap and water, in the operation of engraving engines. Its price is about $1.50 per pound.

Mr. Garvey said that ink-rollers sometimes are spoiled by a heated and moist atmosphere, and inquired whether the glycerine mixture was thus affected.

New Zealand Paper.

Paper is now manufactured in New Zealand from flax grown there—the *phormium tenax*, a perennial plant. It is predicted that paper making will be the staple trade of the islands, and that soon Australia will be supplied from this source.

Submarine Cable.

A submarine cable has just been manufactured at Woolwich for the French Government. It is to connect Carthagena in Spain with Oran in Algeria, a distance of 115 nautical miles. The conducting strand consists of three copper wires, each .038 of an inch in diameter; the weight per nautical mile is seventy-two pounds. Over this are three alternate coatings of Chatterton's compound and gutta-percha, increasing the diameter to 0.26 of an inch, and the weight to 144 pounds per nautical mile. The Chatterton compound consists of gutta-percha, Stockholm tar and resin, and acts as a cement. The wire thus insulated is covered with two strata of twisted hemp strings, dipped in a solution of the sulphate of copper. The hemp coated cable is finally covered by a flexible spiral metallic sheathing of phosphoretted copper; that is the best copper, mixed with 1-400th by weight of phosphorus, added while the metal is in fusion. It is said that the addition of phosphorus increases the tensile strength of copper, and retards the action of air and sea-water. The weight of the cable is 7½ cwt. per knot. Its breaking weight is 26 cwt. Its diameter is nearly half an inch. Its whole length is 137 knots.

Plate Engraving.

An improvement for protecting engraved plates has been introduced in France by M. Chardon, which consists in covering the plate with a very thin layer of iron. The deposit is so fine that the smallest lines in the engraving are found exactly copied, although it does not penetrate the metal elsewhere to any appreciable extent; it is rendered equal by the galvano-plastic process. This has been called "steeling" the plate, but the term misleads, as it has not been found possible to deposit steel. Impressions can be multiplied indefinitely, because when the iron stratum is found to be worn, the plate is plunged into an acid bath, which removes the iron without affecting the copper, and a new layer of iron is applied to it.

Mr. Gavit stated that the use of a covering on the original plate had not been found profitable. It was tried very thoroughly by *The London Art Journal* and abandoned. From a steel plate 30,000 impressions can be taken, from a copper plate only 3,000; the very delicate outlines representing, for instance, the sky, could not be preserved long on copper.

The Chairman inquired whether the copying process by the electrotype was not still practiced by the Coast Survey Department at Washington?

Mr. Gavit replied that it was, but in that case correctness was of more importance than economy. The original plate of surveys is never used for printing, and they could always refer to it as correct.

ENGRAVING BY ETCHING.

Mr. Bartlett directed attention to the invention of E. Vial of Paris, which remedies the evils formerly attending all etching by means of acids. The principal difficulty in the old etching process has been, that as the acid dissolved its way downward into the wax which covered the steel plate, it would also work sideways under the wax, thus widening the channels, as well as deepening them. To prevent this action, M. Vial plunges the steel plate, after a drawing has been made upon it with a greasy ink, into a saturated solution of sulphate of copper containing ten percent of nitric acid. By the action of the steel, the copper is reduced from the sulphate, and all portions of the steel plate, not protected, are instantly covered with a coating of metallic copper which protects the steel from further action of the nitric acid. The acid soaks away the ink, and forms channels in the steel beneath, but it is followed by the copper solution, which deposits in these channels a coating of copper, thus protecting the plate from further action of the acid. This deposit is made first on the edges of the lines, thus the sides of the channel are first protected. As the acid works longest in the middle of the line, the channel is narrowest at the bottom, that is, it has the V form desired by the engraver. Thus all lines, whether fine or coarse, are made in one operation.

Old engravings may be reproduced by this process, by transferring the picture to the steel plate, or the design may be first drawn upon paper and then transferred.

CORRELATION OF MECHANICAL AND CHEMICAL FORCES.

The Bakerian lecture before the British Royal Society, on this subject, by Henry C. Sorby, contains an account of some interesting experiments made by him, relating to the effect of pressure on the solubility of salts. Messrs. Bunsen and Hopkins, had before proved that substances which expand when fused, have their point of fusion *raised* by mechanical pressure. Prof. W. Thompson, had shown on the other hand, that water, which expands in freezing, has its point of fusion *lowered* by pressure; for in this instance mechanical force must be overcome in crystallizations, and under increased pressure, the force of crystalline polarity must be increased by reducing the temperature. Similar principles hold true with respect to the solubility of salt in water. If, when they dissolve, the total bulk increases, pressure reduces their solubility. On the contrary, if the bulk decreases, pressure makes them more soluble. The solubility of a salt in water, appears to result from a kind of affinity, which decreases in force as the amount of salt in solution increases. This affinity is opposed to the crystalline polarity of the salt, and when the two forces are equal the solution is exactly saturated. Temperature alters this equilibrium, and the direction of the alteration depends on the mechanical relations of the salt in dissolving. Mr. Sorby makes the provisional conclusion that increased solubility due to pressure varies directly with the change of volume, and inversely with the mechanical equivalent of the force of crystalline polarity. This correlation of forces seemed to him to explain certain facts connected with metamorphic rocks, and the phenomena of slaty cleavage. It is also possible that several hundred atmospheres of pressure may facilitate some of the chemical changes involved in the transformation of water and carbonic acid into the organic compounds met with in animals and plants of low organizations, found at great depths in the ocean, and thus, to a certain extent, compensate for diminished light.

BESSEMER STEEL.

It is said that two ships in foreign waters, besides one in England, are being built of steel made by the Bessemer process.

HEALTH OF NEW YORK.

The Chairman read a statement presented by Mr. J. Bull, giving the ratio of death in this city, derived from the census of 1860, and the City Inspector's Report for 1861. It appeared that the number of deaths during the year for every hundred of the population, was 1.33 in the Fifteenth Ward, and 7.24 in the Nineteenth Ward; the general average for all the wards being 2.84 per hundred. In relative mortality the wards stand in the following order: 15th, 22d, 18th, 13th, 9th, 16th, 8th, 11th, 20th, 10th, 7th, 17th, 3d, 2d, 14th, 12th, 1st, 21st, 4th, 5th, 6th, 19th.

Inquiry was made why in the Nineteenth Ward the deaths are double those of any other.

Mr. N. C. Ely replied that very many of the hospitals of the city were located in that ward, as well as asylums for children. It was well known that speaking comparatively, mortality among children in this city was unusually large. An interesting discussion followed upon the causes affecting the sanitary condition of the city, in which Messrs. Bartlett, Overton, Gavitt, and Stevens, participated.

ELECTROTYPES.

Electrotype copies of the bronze gates of the cathedral at Pisa, were being made for the South Kensington Museum, England. Mr. Stetson inquired how this process was conducted in this case. Mr. Gavitt replied, that the moulds were doubtless made of gutta percha, or similar plastic material, which could be applied when the object to be copied was in a vertical position.

SURFACE CONDENSERS.

The Chairman having announced the subject selected for the regular discussion, alluded to the recent death of Mr. Samuel Hall, of England, the inventor of the surface condenser, which was first substituted for the Watt, or jet condenser, on steamships, to obviate the necessity of using salt water in the boilers. The first ship which came to our shores having a surface condenser was the Sirius. The device of Mr. Hall was defective, it could not be kept tight. The objections to surface condensers had been obviated by American inventions, and this method of obtaining a vacuum was now being adopted very generally for ocean steamers. Several engineers and inventors are present to take part in this discussion. As Mr. Sewell's diagrams are already arranged before us, he is entitled to the floor.

Mr. Wm. Sewell remarked that he supposed the object of the condenser, and the main difference between the jet and surface condensers, was well known to the audience. He would, however, enter more minutely into the details of this difference. First, he would compare the operation and powers required to work the air-pump when connected with a surface and with a jet condenser.

To condense steam and form a vacuum in the cylinder of a steam engine, the heat in the steam must be absorbed or extracted. This is done by bringing it in contact with a sufficient quantity of cold water or cold metallic surfaces. In the jet condenser the steam is mixed with the condensing water, which absorbs the heat contained therein, and from which the boilers are supplied. If salt water is used to condense the steam, the boilers are supplied with the same.

In the surface condenser the condensing water is made to pass or flow through thin metal tubes, by a small pump or other device, under pressure of one to two pounds per square inch, which takes less than one per cent. of the power of the engine to operate.

The steam is not mixed with the salt water as in the other case, but is admitted to the outer surface of these thin metal tubes, which absorb the heat, and condense it into pure fresh water. This water is taken by the feed-pump, at each stroke of the engine, and returned to the boilers, and being the exact quantity taken from them in steam, is the exact quantity necessary to keep them supplied, and which insures greater safety than when the supply of water depends upon the labor and danger of neglect of a water tender, serious accidents having occurred from such neglect.

The quantity of water necessary to condense a certain quantity of steam varies as the temperature thereof; the colder the water the less quantity is necessary, being from fifteen to forty-five times that contained in the steam.

Ordinary water contains a certain quantity (said to be five per cent) of atmospheric air. With the jet condenser this is admitted with the water to condense the steam, but being permanently elastic, is not condensed, but expands into a large volume in the vacuum space, and impairs the vacuum. All this has to be discharged by the air-pump against the pressure of the atmosphere of some fourteen to fifteen pounds per square inch.

In warm climates, large quantities of water are necessary, owing to its high temperature, and a proportional large quantity of air enters with it, and requires a large air-pump to discharge it. To relieve the engine of this enormous load, it is found to be of advantage to use less injection water to condense the steam, and consequently get less vacuum; the loss of power from this cause being less than when the air-pump is overloaded.

This air and water is not admitted into the vacuum space of a surface condenser; only the water contained in the steam (being only from one-fifteenth to one-forty-fifth part that required above) is to be discharged by the air-pump; consequently a very much smaller one is sufficient to obtain as good, and generally a better vacuum. There is a larger cooling surface exposed to the steam, the condensation is more instantaneous, and the maximum vacuum is sooner formed at the end of each stroke of the engine.

The power to work the air-pump independent of the friction, varies as the quantity of water discharged by it. In middle latitudes, with a moderate temperature of the water used to condense the steam, the power required to operate the air-pump is allowed to be ten per cent of the power of the engine when attached to a jet condenser.

Thus, it will be seen how much less power is necessary to operate the air-pump when connected with a surface, than with a jet condenser. If but one-half is saved, it is five per cent of the entire power of the engine.

Estimate of the value of the gain referred to :

	Per cent.
1st. As before stated, less power necessary to work the air pump....	.05
2d. The heat lost in the hot water blown out to keep the boilers even partially clean..	.12
3d. The heat lost by incrustation on the fire surfaces, in some cases more than twenty per cent..	.05
Total	.22
4th. A higher pressure of steam may be used and a greater benefit obtained by expansion.	

Where the losses named are prevented or saved, less coal and boilers (and less water in them) will exert the same power, requiring fewer firemen and coal trimmers, thereby saving in the daily expenses of the vessel for coal, wages, and food.

Vessels fitted with two engines have two air-pumps. When a surface condenser is attached, one is sufficient as an air-pump, the other to make the water flow through the tubes. This pump, as before stated, works against a pressure of but one to two pounds per square inch, instead of against a pressure of thirteen or fourteen pounds per square inch when used with a jet condenser. The other pump, although used as an air-pump, has less than one-fourth part of the labor it would have if used with a jet condenser, having only to discharge the water contained in the steam.

By this arrangement there is no extra cost for pumps, but only for the tubes and tube sheets for the condenser proper; and as less boiler will exert the same power, the saving in cost will partly pay for the extra cost of the condenser.

In ordinary business transactions twenty per cent is considered a fair profit, but the owner of a steamship using salt water in the boilers pays for and carries in his vessel one-fifth or twenty per cent more boilers (and the additional water contained therein) than is necessary.

He also pays for each day the vessel is steaming for twenty per cent more coal than is necessary to exert the same power.

This extra coal is not only *wasted*, but it requires additional firemen and coal trimmers to take it on board and get rid of it, beside taking up the freight room, and making the vessel draw more water, thus lessening her speed.

There are boilers using fresh water that have been in constant operation from fifteen to twenty years, requiring but little repairs during that time.

The difference between the condensers constructed by him and those of Mr. Hall is, that in his the water was passed through the small tubes; whereas in Hall's the steam was passed through tubes, and the water was thrown around the outside of the tubes. This plan required a much greater number of tubes, and as they were heated by the steam inside of them, they were more liable to contract and expand. Hall's tubes were held by metallic rings; for these are now substituted India-rubber rings, which expand or give way with the motion of the tube. To prevent corrosion or galvanic action, he used copper tubes covered with a thin coating of tin. The steam being allowed to escape into a large chamber, as in the case where the water is within the tubes, there is evidently no loss by back pressure for the want of space. Another advantage of this arrangement is, that a water packing covers all joints, which might by leaking endanger the vacuum. Mr. Sewell then answered various inquiries made by Bartlett, Rowell, Root, and others, regarding structure and effect of surface condensers. Mr. Stetson asked, for the purpose of satisfying those who had read in some work of the action of heat upon water, after the air had all been expelled from it, whether any difference between the action of aerated water and of water deprived of air while in the boiling process, had been observed. Mr. Sewell replied that none was noticed in connection with surface condensers. It was evident that a better vacuum could be obtained than when the water was deprived of air.

Mr. Garvey said there were three conditions to be observed in the boiling of water. 1st. The atmospheric pressure. 2d. The hydrostatic pressure. 3d. The viscidity of the liquid. If the air is driven out of the liquid, its particles are in closer relation, and a different condition arises; but all these differences have but slight effect on the boiling point.

As the time for adjournment had arrived before an opportunity could be given for the exhibition and explanation of other kinds of surface condensers, the same subject was selected for the next discussion.

Adjourned.

American Institute Polytechnic Association,
February 25, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

Oil Analyzing Apparatus.

An apparatus was exhibited for the analytical determination of coal oil, petroleum, &c., by fractional distillation, according to W. Regnault, the distinguished French chemist. It consists of a cylindrical retort, made of copper, of about 300 cubic centimeters capacity, provided with a tabulature at the top for introducing a thermometer, and a bent neck entering into the tabulature of a condenser by a ground joint. The condenser has an interior cylinder of brass, which terminates at the top and bottom in narrow open tubes, the whole being fastened air-tight, in an outer cylinder of the same metal. A continual current of cold water is poured into the condenser through a funnel which opens near the bottom of the same. The hot water is carried off by a tube at the top. The whole apparatus is supported by an iron tripod, at the base of which is an arrangement with five glass cylinders, graduated into cubic centimeters, and standing in a row on a movable support.

The mode of operation is as follows: By means of a pipette, 100 cubic centimeters of the oil to be tested, are introduced through the tabulature of the retort, which should not be filled to more than one-third of its capacity. A thermometer (Centigrade) is inserted into the tabulature of the retort and adjusted so as to prevent it from touching the liquid. The distillation of the liquid is now carried on by means of a gas-burner or an alcohol lamp. If, for example, we wish to separate a mixture of crude oil, 1st, into oils distilling over 100° C. or 212° Fah; 2d, at from 100° to 120°; 3d, from 120° to 140°; 4th, from 140° to 160°; 5th, from 160° to 180° (the last term corresponding with 356° Fah); the mode of operation is to slide the first graduated cylinder under the outlets of the retort, which will catch all the oil condensed from the distillation at the first degree of temperature mentioned, when the second cylinder is placed under the outlet to receive the distillation at the second temperature required; thus the remaining three vials are passed under the outlet. The oils thus collected being condensed in a uniform manner by cold water, will be of the same temperature, and the volume in cubic centimeters in each cylinder will represent the percentage of each oil contained in the mixture.

Mr. Garvey inquired if it was well established that petroleum is a mixture of oils that can be separated at different boiling points—his own experiments showed that very slight variation in temperature gave off a different oil, which on being again heated, passed into vapor at a lower temperature.

Dr. Parmelee remarked that he used about 2,000 gallons of benzine per week, having a sp. gr. of from 70° to 80° Baume, and found it very difficult to get it entirely free from naphtha by heat. Petroleum dealers have no other means of estimating the different qualities of oil than the heat test. Still there is no dividing line between the oils—they can be obtained at almost any specific gravity between certain limits.

The Chairman read his usual summary of scientific news, commencing with a subject bearing upon the one just discussed.

THE BOILING POINT AS A TEST.

The boiling point is not always a test of purity, according to a report to the French Academy by M. Allnard, of experiments, mixtures of two liquids, which mutually dissolve each other in all proportions. Having discovered that ether dissolved with 1-10th its weight of sulphide of carbon, boiled at the same temperature with ether, Allnard made similar observations on a mixture of alcohol and sulphide of carbon, also on mixture of alcohol and ether. He admits that to determine the purity of a liquid recourse must be had to M. Regnault's method of determining the elastic force of its vapor. The presence of any substance added either to alcohol or sulphide of carbon to the amount of 1,000th part can thus be detected.

A NEW DISEASE.

It is now admitted by medical authorities that a new disease is added to the catalogue of human ills. Isolated cases of it in Europe have from time to time been reported, but a communication from Dr. Müller, of Homberg, in *The London Lancet*, contains an account of its propagation as an epidemic in Hettstaedt, a small town of five or six thousand inhabitants in

Prussia, where it originated in consequence of the first-infected person having eaten a kind of sausage not thoroughly cooked. It was made of pork which contained the microscopic worm known as *trichina spiralis.* These trichinæ make their way through the lining of the human intestines and are found in immense numbers in the muscles. Dr. Müller states that when he was called to the town to see a patient, eighteen or twenty persons had died, and eighty more were afflicted with all the symptoms of trichinæ fever. The symptoms of the disease correspond with those of the typhus, with the addition of an enlargement of the spleen and intense pain in the muscles, particularly in the calf of the leg. On examining small portions of muscle from living patients with the microscope, crowds of these trichinæ could be seen. Picric acid was administered without success. Leuckart states that trichinæ are not killed in pork by salting or freezing it, nor on its becoming putrid. Imperfect smoking and imperfect cooking of the pork will not destroy them. Their complete destruction is only effected when every portion of pork has been raised to a temperature above the boiling point.

The Lalande Prize.

The prize of the French Academy, which, it will be remembered, was last year awarded to Alvah Clark, of Cambridge, Mass., has this year been given to M. Chacornac, for his astronomical observations. He has discovered seven small planets altogether, and first reported to the academy the curious phenomenon of a variable nebula in the constellation Taurus.

Spontaneous Generation.

This question, which has long been discussed in the French Academy, is soon to be settled. M. Pasteur and M. Pouchet, the leading disputants, are to repeat their experiments before a committee of prominent members, whose decision shall be regarded as final.

Albumen Transformation.

M. Schutzurbergen has reported to the academy experiments which prove that coagulated albumen and casein may be transformed by dialysis into a soluble albumen coagulable by heat.

A Great Gun.

An iron gun has just been successfully cast at the Fort Pitt foundery, and cooled on the Rodman plan of circulating cold water in the core, the mold being set perpendicularly. 170,000 pounds of iron was melted for this purpose in three furnaces, and the pouring was completed in twenty-two minutes.

The following is a statement of the dimensions :

Weight of gun in the rough	160,000 lb.
Weight when finished	112,000 lb.
Total length, finished	20 ft. 4 in.
Length of bore	17 ft. 6 in.
Diameter of bore	20 inch.
Maximum diameter of gun	5 ft. 3 in.
Minimum diameter	2 ft. 10 in.

The gun will use a spherical shot of 1,000 lb., or a shell of 750 lb. If the gun is rifled it is thought it will carry a shot of one ton weight. The charge of gunpowder will weigh from 80 to 100 lbs. This gun is said to be the largest in the world, and to Pittsburgh belongs the honor of producing it. Report says it is to be placed on some of the defences of the harbor of New York.

PRIZES.

The French Academy of Science, offer a prize of a gold medal, value 3,000 francs, for the best paper on "The Comparative Anatomy of the Nervous System of Fishes;" latest day for the reception of papers, Sept. 1, 1864. Also 3,000 francs for the best paper on "The Production of Hybrid Animals by means of Artificial Fecundation;" latest day December 31, 1865. Also three prizes, in all amounting to 30,000 francs, for papers on certain medical and surgical subjects. Competition for all these prizes is open to all the world.

An article on "the Manufacture of Chocolate" was read, and called forth remarks from several members.

Dr. Rich stated that chocolate has been made in this city of such fine quality as to bring orders for it from France, which has always been considered foremost in this manufacture.

Articles on "confectionery," "the preservation of meats," and "the frigate Re d'Italia," were read, which are too long to insert.

GREAT GUNS.

In regard to casting great guns, Mr. James L. Jackson doubted the practicability of making perfectly sound castings of such great size. He had examined some fragments of large guns with a glass and found them very porous.

Mr. Fisher said this question of the even quality of large castings was an important one. He inquired whether any one could give information regarding the quality of the interior of iron chilled some time since at the Novelty Works.

Mr. Maynard replied that the mass of iron alluded to (a solid 5 feet by 7) was not chilled in the furnace; it had been poured into a ladle to be used with other meltings, to form a bed-plate for a steamship, but when the men were ready to pour, it was found to be chilled. It was said that it would not pay to break it up; but the breaking was afterward accomplished, and on examining the fragments he was surprised to find its texture even and consistent to the center. The large guns alluded to have not so long a range as may be supposed. The effective work now being done at Charleston is by 12-pounders, and not by 200 or 300-pounders.

The subject was further discussed by Messrs. Rowell, Bartlett, and Rosevelt.

After some inquiries from Mr. Root on the subject of specific heat, the selected subject was taken up.

THE NECESSITY FOR A REFORM IN OUR WEIGHTS AND MEASURES.

The chairman remarked that this subject has of late commanded the attention of leading men in every civilized country. There is an increasing desire for the adoption of the same standard, and a uniform system of weights and measures throughout the world. Much labor is spent in computations, and many errors are made in calculations, as the consequence, which would be avoided if the commercial world, in making estimates of quantity, used synonymous terms. With them a translation from a foreign language involves computation. Our progressive movements have thus far related principally to applications of physical power, yet there is no reason why reform should not embrace economical measures in relation to mental as well as muscular exertion. The transportation of freight over two railways of different gauges, requires its transfer from one train to another. The delay and labor involved in this movement have compelled railway companies to adopt a uniform width of track. So the transmission of accounts from one country to another, having a different system of weights and measures requires a transfer in terms; the time and thought expended in this process can only be saved by an international compromise which shall secure to commerce a uniform system. The speaker then directed attention to the evils arising from a misunderstanding of foreign terms even in our daily reading. A single instance occurring lately in the transactions of this association was alluded to for the double purpose of illustration and correction. The difference of the star Sirius was given, as stated in an English journal, in which the word billion was written; in the printed report of our proceedings in the N. Y. Tribune, the distance is in figures, estimating the billion as used in this country and on the continent of Europe, at one thousand millions. But the English billion is one million of millions, and was in this instance so used as will be seen by calculating the distance by the time required for the light of Sirius to reach us, twenty-two years. The speaker then pointed out other discrepancies in the meaning of terms. In Spain, the yard is 33.04 inches; in the United States and England, it is 36 inches; in Prussia, 36.57 inches; in Austria, 337.5 inches; in France, 39.13; in Russia, 39.51; in Switzerland, 57.60. The land-yard varies considerably in different parts of the British kingdom, at Hertford it is 3 feet, and at Downpatrick 21 feet.

The mile, estimated in American yards, is in Netherlands 1,093 yards; in England and this country, 1,760; in Scotland, 1,984; in Ireland, 2,038; in Spain, 2,472; in France, 3,025; in Germany, 10,120; in Sweden, 11,700, or more than six and a half American miles.

The fact was also alluded to, that we have in this country two estimates for the pound, two for the hundred weight, and two for the ton.

Mr. G. Bartlett spoke of the advantages of the decimal system as adopted by France. The scientific men and journals are taking the lead in the use of that system. England is so conservative she dislikes to leave the old ruts, and is consequently behind most of the Continent of Europe in the use of the decimal system.

Mr. Overton spoke further of the advantages of the French system, based on the meter one-forty-millionth of the earth's circumference which is equal to 39.37 American inches.

The chairman said that a more correct estimate of the earth's circumference made, since the adoption of meter, had slightly altered the ratio as stated. The English standards were destroyed at the burning of the Houses of Parliament in 1834, and new ones were not completed until 1844.

Dr. Parmelee remarked that all metallic measures were liable to oxidation; he would propose as the standard weight a diamond, of great size, for instance, that now belonging to the Queen of Great Britain.

Mr. Fisher said that John Quincy Adams paid great attention to this subject; he proposed that the standard yard should be a pendulum of a fixed rate of oscillation.

Mr. Gavit alluded to the work of Haslett in providing standards to the several States by order of Congress, and related some singular facts regarding a standard of measure sent to North Carolina. Of course it was not to be touched by the hand, but when recently found in that State it was bent, and appeared to have been hammered. This incident illustrates the civilization of that part of our country.

After remarks by Mr. Miller and others it was agreed to take up the subject again. That selected for next Thursday evening is "The Use of Surface Steam-Condensers." Adjourned.

American Institute Polytechnic Association,
March 10, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

Iron Ores of Missouri.

During the time devoted to the examination of new inventions and discoveries, Dr. R. P. Stevens, geologist, gave an interesting account of recent explorations made by him of the great iron deposits in the State of Missouri. He presented not only specimens of iron ore from that region, but from various other localities, and gave the percentage of iron in each.

Iron Mountain is 260 feet above the surrounding valley, and 1,206 feet above St. Louis. It covers an area of about 500 acres. It is nearly a pure specular iron ore, containing only a little silex. It is massive, without any signs of stratification. Upon its slopes, at its base, reposes a sandstone, and above the sandstone is a layer of limestone, containing fucoids, showing that the mountain has been upheaved since these lower Silurian deposits were laid down.

The Pilot Knob is a much higher mountain, its elevation being nearly 600 feet. It is composed of alternate strata of porphyry and specular ore. The mass of ore opened is nearly at the summit of the mountain; the quarry is 300 feet long, by about 50 feet deep, and is composed of two masses, separated from each other by a divisional band of slate, from two to three feet deep. The strata of this mountain dip south-west 30°. Upon its flanks repose the same lower Silurian deposits as on the Iron Mountain.

The theory Dr. S. inclines to is that of Bischoff, viz: that specular ore is the metamorphosed condition of an iron deposit in some earlier ages of the American continent, and which was upheaved (not erupted nor injected) after the Silurian period.

The Chairman then presented the following interesting summary of Scientific and Technological investigations:

Substitute for Gunpowder.

A new explosive compound has been made in England, by pulverising, separately, forty-seven parts of chlorate of potash, thirty-eight parts of ferrocyanide of potassium, and five parts of sulphur; these are mixed, and with water formed into a paste; the water is allowed to evaporate, and ten parts of India rubber are added. These ingredients, when mixed and molded into any required shape, form a solid, compact body; and are said to answer the purpose of ordinary gunpowder.

Improved Davy Lamp.

An English improvement on Sir Humphrey Davy's Safety Lamp, indispensable in coal mines, is an arrangement of an extinguisher and lever connections with the wire gauze so that the instant the gauze is removed the light is extinguished.

Essential Oils

Mr. T. B. Grove's method of separating and collecting the essential oil which exists in minute quantities in the watery solution produced by the distillation of aromatic herbs, is to add to such solution a proportion of olive oil. This is formed into a soapy emulsion by potash. When the emulsion is destroyed by adding an acid, the olive oil rises to the surface, bringing with it all the aromatic oil, which may be dissolved out by agitation with rectified spirits.

Laboratories.

A London journal recounts the scientific benefits conferred by the Royal Institution of Great Britain during an existence of sixty-four years, and complains that while the Universities of Bonn and Zurich are spending $150,000 for improvements in the chemical departments, the laboratories of the Royal Institution are fit only to be called back kitchens.

Preservation of Meat.

The Admiralty of Great Britain are now making experiments with the process of Dr. Morgan for the preservation of meat. It consists in forcing through the arteries, capillaries, and veins of the slaughtered animal, brine, which carries before it the blood, and both make their exit through an incision provided for that purpose. The brine tank is elevated about twenty feet, so as to give sufficient pressure to the fluid, which passes through a tube into the chest of the animal. Another tank, at the same height, contains a mixture, consisting of six and a-half gallons of brine, ten pounds of sugar, and three-quarters of a pound of saltpetre, with an infusion of cloves and pepper. After the first or cleansing operation, requiring about six gallons of brine, the fluid from the second tank is forced through the same passages. The exit being closed, every part of the body is thus traversed by the fluid. The whole process of cleaning and infiltration does not occupy more than twenty minutes. The animal is soon after skinned and cut in pieces, which are thoroughly dried and packed in saw dust and charcoal. It is said meat treated in this manner will stand any climate, and that more of its nutritive qualities are preserved than by the ordinary process of curing.

White Ants.

The Admiralty are also seeking the best means of securing the destruction of the white ants introduced into Jamestown twenty years since from the coast of Guinea. They have multiplied so as to injure every building in the place, and have reduced some to such a state of ruin as to compel the inhabitants to abandon them. Similar experience is related of the white ant in India, where, if they once gain access to a house, their eradication is impossible, unless the house is taken down and rebuilt.

Mr. H. W. Bates, who had much experience respecting these insects in South America, states that they do not attack houses, furniture, or boxes made of hard wood called acapu. It was customary to protect articles of softer wood by placing them on blocks of acapu. He found they could be expelled by the use of the arsenical soap employed in preserving skins. This compound—consisting of common soap, carbonate of potash, and white arsenic—is made into a lather and brushed over the articles to be protected. This involves the dissemination of arsenic in the atmosphere, and must be dangerous to the health of the inhabitants. The ravages of the insects on the sleepers and wood-work of the East Indian railways have been prevented by the use of creosote, which, however, has an odor so objectionable as to prevent its use in dwelling-houses.

Blood Corpuscles.

Prof. Beale, in a communication to the "Quarterly Journal of Microscopic Science," says: "It is most remarkable that the red coloring matter of the blood corpuscles of different animals should crystallize in different forms. There are instances of animals closely allied to each other, the blood crystals of which are quite distinct; for example, the red coloring of the guinea pig assumes the form of the tetrahedron, while that of the squirrel crystallizes in six sided plates, and that of the hamster in rhomboidal crystals. [The Hamster is an animal of the rat tribe, with large cheek pouches, inhabiting the northern part of Europe.] The red matter is not living, but results from changes occurring in the colorless living matter, just as cuticle or tendon or cartilage, or the formed material of the living cell, results from changes occurring in the germinal matter of each of these cells. The colorless corpuscles, and these small corpuscles which are gradually undergoing conversion into red corpuscles, are living, but the old red corpuscles consist of inanimate matter.

Henna.

This plant (*Lawsonia inermis*), long used in Egypt as a cosmetic and dye-stuff, has been prepared and introduced into commerce by Messrs. Gillet and Tabourin, chemists, of Lyons, France. The active principle is a peculiar kind of tannic acid, which they propose to call henna-tannic acid. The dried leaves of the plant contain one half their weight of this substance. It imparts to silk different shades of black, which are beautiful and permanent.

Heat of the Sun's Rays.

The observations on this subject by the late Dr. Otto Hagan have been communicated to the Prussian Academy of Sciences. The most important conclusions are: 1st. That the height of the atmosphere, presupposing an equal power of absorption in the different superimposed strata of air, is only equivalent to the 173d part of the earth's radius. 2d. The amount of heating power of the sun's rays, on entering this atmosphere, is determined by the fact that a beam of rays, a square inch in cross section, would during one minute elevate the temperature of a cubic inch of water 0.733 of 1° Centigrade. 3d. The loss of heat in its passage through the atmosphere, taken on different days and seasons, and when the air is apparently clear, is variable.

Pouillet found the heat of the sun's rays one-eighth part smaller, but he gave the atmosphere a height of one-eightieth of the earth's radius. The height of the atmosphere, according to Hagan, is a little more than twenty-three miles; according to Pouillet, 50 miles. The following table shows its density at increasing heights, and the height of the mercurial column, corresponding:

Height in miles.	Volume.	Barom. in inches.
0	1	30
2.705	2	15
5.41	4	7.5
8.115	8	3.75
10.82	16	1.875
13.525	32	.9375
16.23	64	.46875

GREAT RAILWAY BRIDGE.

The new bridge now being built on the railway route leading from New York to Washington, across the Susquehanna river at Havre de Grace, will be 3,300 feet long, and supported by thirteen stone piers, each 240 feet apart; seven of these will have pile foundations and six rock. They will be constructed so as to resist the greatest pressure of ice which it is possible to bring against them. The greatest depth of water in which these piers are laid is forty-two feet. The bridge will have "a draw" on the pivot plan, with two openings of seventy feet each in width. The railway track will be twenty-five feet from the water; above that will be a common carriage-way. The entire height of the bridge will be fifty feet—its estimated cost is $700,000. It was intended to build the superstructure of iron, but the high price of that material may cause the substitution of wood.

SURFACE STEAM CONDENSERS.

The selected subject was then taken up.

Mr. S. H. Maynard opened the discussion by alluding to the difference between surface and jet condensation, which had been fully explained at the last meeting. The inquiry was then made, that as the cost of constructing the surface condenser was greater than that of jet condenser, what was the money value to induce owners of steamships to adopt it? And in answer he presented the following comparative statement of value of jet and surface condensation, as shown by the log of the Sonora, Pacific Mail Steamship Company's steamer, during five consecutive trips with each kind of condenser.

1st. With surface condenser, feeding fresh water to the boilers:

Average running time	12 days 16¼ hours.
Coal consumed	420 tons.
Oil expended	56 gallons.
Tallow	43 lbs.

2d. With the jet condenser and salt water feed:

Average running time	13 days 21 hours.
Coal consumed	471 tons.
Oil expended	78 gallons.
Tallow	125 lbs.

As the steamer made twenty trips per annum, it will be apparent that the increased expenses of the jet over the surface condenser would be: In time, twenty-four days; in coal, 1,020 tons; in oil, 440 gallons; in tallow, 1,640 lbs. The money value of which at the time was as follows:

1,020 tons of coal, at $25	$25,500
440 gallons of oil, at $1.90	836
1,640 lbs. of tallow, at 12½c	205
Boarding 300 passengers, twenty-four days. at $1.00	7,200
Total	$33,741

The vacuum on the Sonora averaged 26 inches by the mercurial gauge, with the water at 142 deg. F. for twelve days consecutively in the month of June.

The improvements on Hall's condenser have been fully illustrated before this association. It is now proposed to examine more minutely the defects common to all, and the manner in which they can be completely obviated. The chief difficulty to be contended with in such condensers is the continued contraction or expansion of the tube within the condenser, arising from the changing of temperature, by injection of steam and cold water; this added to the weight which the tubes must sustain, produces fractures in the various joints and seams. The wear of the tubes must be necessarily rapid, and the time must sooner or later arrive when, in consequence merely of such wear, the condensing surfaces must give out. The moment at which this will occur cannot be foreseen, but it will almost certainly take place at a time when the continued working of the engine is particularly needed, as for instance, during a storm, since then the forces are most energetically in operation, which lead to its destruction.

The surface condenser in the ocean steamer the British Queen, gave out in a gale, causing for a time the stoppage of the engine; the vessel, however, was saved. Some eminent engineers entertain the opinion that the loss of the President must have been from the disabling of her surface condenser. The apparatus to be described remedies the defects mentioned. It consists in enclosing the surface condenser within a tank or vessel, which shall be so constructed as to be capable of serving as an ordinary jet condenser, when any derangement of the tubes or other condensing surface proper shall require it, thereby affording an alternative which shall secure the continuity of the vacuum, though, of course, at the expense of the loss of the whole or a part of the fresh water afforded by the surface condenser when in perfect order. Another highly important feature in this arrangement is the ability to maintain a vacuum more or less perfect, but, nevertheless, equal both within and without the tubes, and thus relieving the surface condenser from atmospheric pressure. The danger of fracture caused by this pressure, as well as the impairing of the vacuum by small leaks, are thus obviated, while, as it is only required to secure the tubes against movement at one of their ends, the other ends may be left free to move, and hence the disruption attending the expansions and contractions cannot occur. These constitute the principal peculiarities of the Pirson surface condenser, which the speaker proceeded to explain in detail by the aid of a model, after which instances were given where resort to this method, after other experiments had been tried, was successful. Over $100,000 had been expended on the ocean steamer Adriatic, when the owners were obliged to avail themselves of this plan. That their decision was wise will be admitted upon examining the condensing apparatus of that vessel. It contained over 5,000 tubes of copper, each 12 feet long and five-eighths of an inch in diameter. The total length of tube being 60,000 feet, or a little over 10 miles. This arrangement involved 10,000 joints, which must be kept tight, and as the metal of the tubes must necessarily be thin in order to transmit the heat from the steam within them to the cooling medium without, if any one of them or of the joints failed, the vacuum would be impaired. Therefore any plan which could secure to the engine the usual vacuum, in spite of leakages, would be a valuable desideratum.

In answer to a query whether a steamer could be run to Hong Kong with the same fresh water, Mr. M. said: Theoretically the answer would be in the affirmative, but practically this could not be done, on account of leakages in the boiler, by which the fresh water would be wasted. As there are usually several boilers in each steamer, it is a good plan to use, in one of these boilers, salt water only, which would make up for the loss by leakage. In reply to an inquiry regarding the highest approximation to a vacuum made with the surface condenser, Mr. M. remarked that 27 or 28 inches by the mercurial gauge could be produced; this, however, is at the expense of temperature in the feed water, and as it is essential to carry the feed water into the boiler as warm as possible, there would be, in reality, no saving of fuel in approaching any nearer a perfect vacuum than as has been stated. In the Cunard line of steamers the vacuum is carried at 24 inches, because of the increased quantity of injection water required, and the consequent labor of the air pump.

In order to guard against galvanic action it was found better to use pure Spanish copper. It was preferable for this particular use to that from Lake Superior, which contains an appreciable quantity of iron. It should be observed that galvanic action also occurs on steamers which do not use surface condensers.

In concluding, Mr. Maynard alluded to another device for saving the fresh water resulting from steam, the patent for which expired in 1860. It consisted in the use of a fixed quantity of fresh water, to be used in the ordinary jet for condensing the steam. Instead of throwing away this water, it was cooled so as to be used again in the jet, by passing it through a series of pipes, the exteriors of which were surrounded by cold salt water, constantly forced in and discharged by means of a pump. In this case

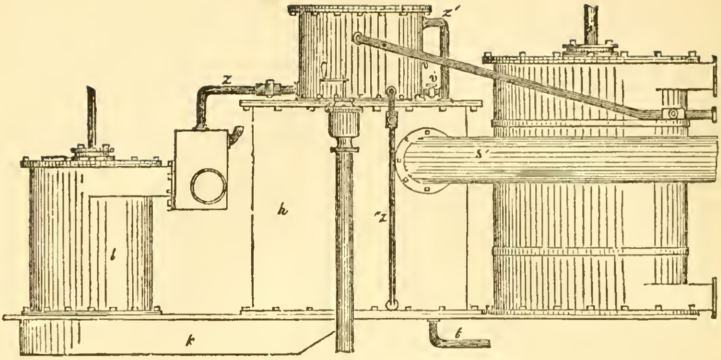


Figure 1.

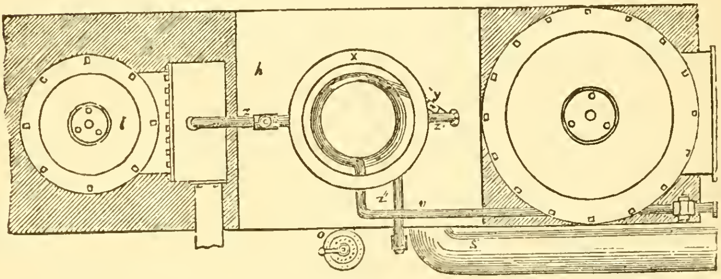


Figure 2.

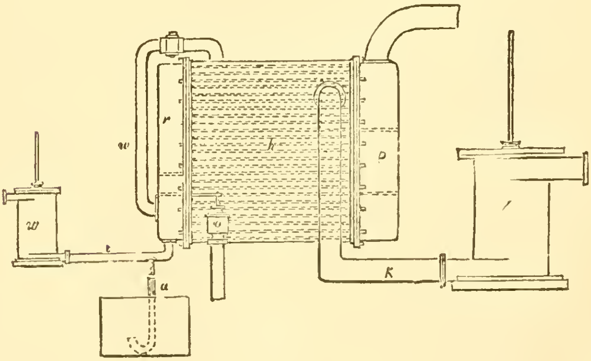


Figure 3.

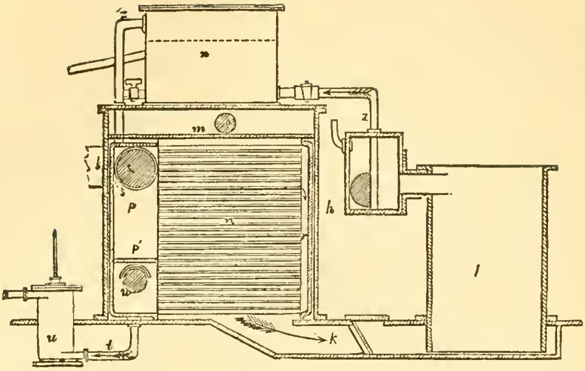


Figure 4.

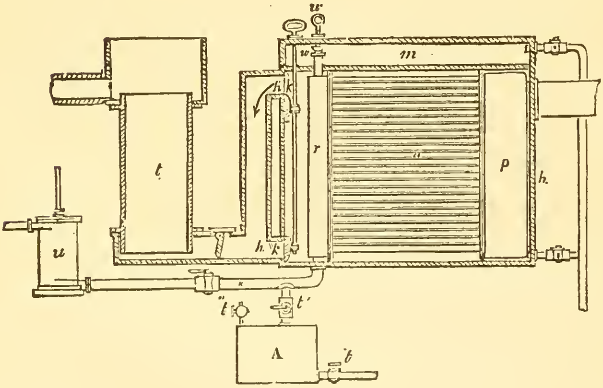


Figure 5.

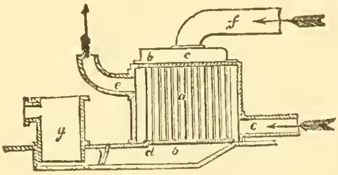


Figure 6.

leakage from the boiler must be made up by using salt water in the boiler. It requires more tubing than the surface condenser. The apparatus now known as the decalorator is an application of this principle.

Mr. Maynard occupied the floor in replying to various questions relating to the practical operation of the Pirson condenser.

The following is an illustrated description of the Pirson condenser described by Mr. Maynard:

Fig. 1 is a side elevation; fig. II is a top view; fig. III is a longitudinal vertical section. Figs. IV and V are views, showing variations in the construction of the same apparatus. Fig. VI is a view of a surface condenser of common construction, and similar letters refer to similar parts throughout, unless specially noted to the contrary.

Figure VI exhibits the usual mode of construction. At A is a cluster of pipes (that being generally the best form to resist pressure) inserted in two flanges, B. The ends of these pipes are covered at C by a cap, and at D by the channel in the bed-plate; at E is a tank to hold the water for condensing, which flows in and out, as indicated, being usually driven through by a force-pump. At F is the exhaust pipe for conveying the steam to be condensed, and G is the air pump. The steam is thus condensed, by coming into contact with the cold surface of the metal, the pump G maintaining the vacuity of the pipes, by removing the water as fast as it accumulates in the channel D, and also any air or uncondensed gases. Hence the external surfaces of the tubes are subjected to the pressure of the atmosphere, and also to that of the column of water in which they are immersed, as before named. This mode of condensing steam has these difficulties to contend with, and which have hitherto been found insuperable, viz: the heating and cooling of the metal pipes, consequent upon the periodic injections of the steam, and of the action of the cold water, causes a continual alteration of expansions and contractions; and these, together with the great pressure upon them, soon produce fractures in the various joints and seams. When such occur the vacuum can no longer be maintained, because of the flowing in of the air, and also of the water, which, of course, is fatal to the whole operation. In addition to these defects, this system has another, resulting from the fact that, as the wear of tubes so situated must be necessarily rapid, the time must sooner or later arrive when, in consequence, merely, of such wear, the condensing surfaces must give out. The moment at which this will occur cannot be foreseen, but it will almost certainly take place at a time when the continued working of the engine is particularly needed—as for instance, during a storm, since then the forces are most energetically in operation, which tend to its destruction.

Previous to the date of my invention, although many plans had been devised for prolonging the wear, or lessening the liability of the condensing surfaces to fracture, still none had been brought forward which claimed to be able to continue the condensation and maintain the vacuum when such fracture did occur. The ability to do this is the *principal characteristic* of my invention; while in carrying that out it will be evident that some of the forces which, in the old condensers, were most effective in causing fractures, do not in mine exist at all, while others are exerted harmlessly.

The nature of my invention may be stated, therefore, as consisting, firstly, in enclosing the surface condenser within a tank or vessel, which shall be so constructed as to be capable of serving as an ordinary jet condenser when any derangement of the tubes or other condensing surface of the surface condenser proper shall require it, thereby affording an alternative which shall secure the continuity of the vacuum, though, of course, at the expense of a loss of the whole, or a part of the fresh water afforded by the surface condenser, when that is in perfect working order.

A second and highly important feature results from the above named construction, viz: the ability to maintain a vacuum more or less perfect, but, nevertheless equal on both the outside and the inside of the surface condenser, at the same time, and thus to relieve said surface condenser from atmospheric pressure. The danger from fractures caused by this pressure, as well as the impairing the vacuum, caused by small leaks, are thus obviated, while as it is only required to secure the tubes against movement at one of their ends, the other ends thereof may be left free to move, and hence, the disruption usually attendant upon the alternate expansions and contractions, does not, in mine, occur at all.

The following exhibits a method of construction, which, it will be seen, bears out fully the above allegations. At the letter H is represented a box or case, composed of metal, and of sufficient strength to resist the pressure of the atmosphere, and it is also to be made air and water tight, as far as possible. In the underside of this there is an opening, I, Fig. III, through which a connection is made by a channel, K, with an air pump, L, of a common construction. At M is a perforated plate, on which the water for effecting condensation is received, being for the purpose of dispersing that water in a manner well known; and at O is a pipe and cock for injecting said water. Into the box, thus constructed, which will be recognized as an ordinary "jet condenser," I next introduce a "surface condenser"—that is to say, an apparatus by which steam is to be condensed by contact with cold metallic or like surfaces, and which I make as follows:—At N, Fig. III, is shown a number of pipes, or tubes, arranged horizontally, their ends being fixed into plates or flanges of metal, having holes perforated to receive them. I cover the ends of said tubes, by attaching caps, P and R, to these plates, as shown in section Fig. III. The tubes thus arranged are introduced within the box, h, as shown. In the cap, P, there is an opening made at S to receive the end of the pipe which conveys the steam to be condensed, and which pipe is seen at S_1. This steam pipe is bolted tightly to the outside of the box, H, by a flange, and its end extending into the box, enters the cap, P, at S, as shown. The cap, P, is divided into compartments, by a partition, P_1, the object of which is to cause the steam to traverse through two sections of tubes. More partitions may be introduced, to insure full and equal distribution of the steam to each tube. At T, is shown a pipe connected with the lower side of the cap, P, and passing through the box, H, having a tight joint where it comes out. This pipe terminates in a pump, U, the use of which is to pump away the water resulting from the condensation of steam, and which collects in the bottoms of the tubes and in the caps. At W is an opening in the lower division of the cap, P, which forms a passage from the tubes to the interior of the box, the use of which will be described more fully. This opening, W, is to have a door, or valve, over it, of common construction, which may be opened or closed, by a handle from the outside of the box, or case, H, or may be made to operate of itself, the handle working through a stuffing box in H.

I have described this part of my invention as being made of tubes, or pipes, chiefly, but it is obvious that other forms may be substituted, as sheets of metal, coils of pipe, &c., and the operation of it is as follows:—The engine being started in the usual manner, the exhaust steam flows through the pipe, s^1, into the cap, P, and thence into the cluster of tubes, N. At the same time, a jet of cold water is admitted through the injection cock, O, on to the perforated plate, M, from which it falls in a shower, upon the tubes, N, and thus, by a well known law, at once condenses the steam, the water resulting, being collected in the bottom of the tubes and caps. The large pump, L, removes the condensing water as fast as it accumulates from the box, H, and also maintains a vacuum therein. The smaller pump, U, removes the water resulting from the condensed steam, in like manner, at the same time maintaining a vacuum within the tubes. The condensing water is allowed to flow off, as fast as discharged from the pump, L, but the water taken from the tubes is discharged into a suitable reservoir, to be used as feed to the boilers. The aperture, W, is for the purpose of insuring the maintenance of an equal pressure on each side of the tubes, or rather to prevent them from being subjected to any pressure, either internal or external. This can be made apparent, as follows:—Supposing the orifice, W, closed, and the cold water admitted in quantity sufficient to condense a part of the steam only, it will be evident that the vacuum within the case, H, will be better than that in the tubes, and the difference will be as the volume of uncondensed steam; now if we open the door or valve, over the aperture, W, a portion of the steam in the tubes will at once rush through, and extend itself throughout the case, H, until an equilibrium is produced. So long as the steam is fully condensed, and the operation of the pumps, L and U, is also equal, so long, of course, the surface condenser, N, will be subjected to the same pressure, both externally and internally, or rather will not be subjected to any, even if the orifice, W, be kept closed. The use of the opening, W, therefore, is to insure the preservation of the equilibrium, in cases where the steam is not fully condensed, or where the pumps fail to work equally, the atmospheric pressure being in all cases sustained by the case, H, whether the vacuum is maintained within the tubes, or not. The peculiar feature of an alternative will now be seen, for so long as the various joints of the surface condenser remain tight, and it is otherwise in good order, the operation will go on as in the old kinds of condensers. Should a fracture occur, from any cause, as by some of the tubes wearing out, the box or case will at once come into play, as a jet condenser, to condense so much of the steam as shall escape through the defective tube, or tubes, and the occurrence of such a defect would still further serve to illustrate the advantage of my said improvement; for whereas, in the old surface condenser, a comparatively small leak would at once destroy its operation; in mine, that only involves the loss of so much of the fresh water as can escape in the form of steam through the defective aperture.

By the foregoing description it is seen, that the condensing water is applied to the surface condenser, in the usual manner of a *jet* condenser, viz.: as spray or a shower; I consider this the preferable mode to apply the same, as thus the feature of an alternative, becomes operating, being always ready to come into play as occasion shall require. Other variations in the construction may be made, whereby the jet must be especially applied, as in the case of filling the tank and immersing the tubes, or when the cold water is passed through the tubes. In the last named case, the steam will be exhausted directly into the box, H, and the jet will only be applied in case of accident — several of these modifications will hereafter be described.

When Mr. Maynard resumed his seat, it was decided by the Association to continue the discussion of Surface Steam Condensers at their next meeting. Adjourned.

American Institute Polytechnic Association, }
March 17*th*, 1864. }

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

New Barometer.

During the time devoted to new inventions, Mr. G. Bartlett illustrated on the black-board and described a newly invented barometer, which is formed of a thermometer tube open at the upper end, with a drop of mercury near the middle, the space below being filled with air. At the time of making an observation the bulb is placed in the observer's mouth, to bring the air of the bulb to the constant temperature of the body, when the height of the mercury will indicate the weight of the atmospheric column. Quite an animated discussion arose as to the feasibility of bringing the temperature of the instrument to the same point by the proposed method, in which Messrs. Stetson, Bartlett, Maynard, Minthorne, Root, Dr. Parmelee, and the secretary Mr. Garvey, participated. The prevailing opinion appeared to be that for observations where strict accuracy was not required, the instrument would be convenient and useful.

The Chairman read the following summary of scientific intelligence:

Magnetic Storms.

Mr. Airy, the Astronomer Royal of the Greenwich Observatory, in a paper read before the Royal Society, propounds a theory to account for magnetic storms. The phenomena represent the movements of a magnetic ether, which he supposes to overspread the whole surface of the earth, as an impalpable fluid envelope, several feet in thickness. If we conceive this magnetic ether to be subject to occasional currents, produced by some action or cessation of action of the sun, which currents are liable to interruptions and perversions of the same kind as those of air and water, we have a theory by which the disturbances that occur in terrestrial magnetism may be explained.

The Chairman remarked that this hypothesis may assist the student in comprehending the action of extraordinary magnetic perturbations. It should be regarded, however, as a conditional structure, only to remain until the true foundations of the science are laid, by the broader generalizations of some future Gauss. It may be suggested in this connection that the implied coexistence of several distinct "ethers," as the mediums of the forces of light, heat, actinism, magnetism, and electricity, is quite as objectionable as the corpuscular hypothesis. May not all these manifestations arise from the varying density, and diverse motions of the same elastic, subtle, all-permeating, all-pervading "*œth*," which fills the interstellar spaces, and in a more compact state, envelopes both atom and orb?

DECOMPOSITION OF IODIDE OF MERCURY.

H. Rose, in *Poggendorff's Annalen*, states that Iodide of mercury is easily decomposed by cyanide of potassium. To estimate the amount of mercury in the iodide, the cyanide of potassium is first rubbed in a mortar, with twice its weight of quicklime. A little carbonate of magnesia is then placed in a tube, closed at one end; the iodide is mixed with eight or ten times its weight of cyanide, a layer of lime is next introduced, then a layer of cyanide, and lastly, carbonate of magnesia is placed on the top; the tube is now drawn out and bent, its extremity being made to dip into a receiver containing water. Heat is now applied to the mixture beginning at the top, and the mercury distils over.

Other mercurial compounds may be decomposed in the same manner.

According to Carius, iodide of mercury is completely decomposed by digestion with nitrate of silver, not very acid. Iodide of silver, like iodide of mercury, is slightly soluble in nitrate of mercury.

The red iodide of mercury may be reduced by a solution of proto-chloride of tin, when hydrochloric acid is added, and the mixture is supersaturated with it, metallic zinc completely decomposes iodide of mercury in the presence of water forming iodide of zinc.

PURIFICATION OF SULPHURIC ACID.

F. M. Lyle, gives in *The London Chemical News* the method practiced by him. If the acid contains nitrous compounds it is heated in a porcelain capsule, to about 110 deg. C, with a small portion, one-quarter to one-half percent of oxalic acid, previously added, till the latter is decomposed and effervescence has ceased. The acid is then allowed to cool down to about 100 deg. C, and bichromate of potash, in fine powder, or in solution with sulphuric acid, is then added until the green color first produced by the formation of sesquioxide of chromium is replaced by a yellowish green, indicating a mixture of chromic acid in a free state. The acid so prepared, being now distilled, passes from the first perfectly free from all impurities.

ON THE SECULAR COOLING OF THE EARTH.

The Rev. Prof. Haughton, of Trinity College, Dublin, in a paper read before the Dublin Geographical Society, expressed his belief that the time during which organic life has existed on the earth is practically infinite, because it can be shown to be so great as to be inconceivable by beings of our limited intelligence. The commencement of organic life on the globe cannot be placed further back than the time when the temperature of the Polar regions was 122 deg. fahrenheit, at which degree albumen coagulates. He directs attention to the subsequent period, but so much later that the lapse of time is beyond our conception, when Great Britain had cooled to that temperature, and from calculations and data given, he proves that the time which elapsed before the mean temperature of the island had fallen to 77 deg., in consequence of the coolness of the earth, to be 1,018,000,000 of years. This is the London clay tertiary epoch, during which mollusks inhabited the seas of Great Britain.

The Chair directed attention to the interesting fact just stated, that albumen, an essential element in animal organization, coagulates at 122 degrees F., or 50 degrees Centigrade, which is just midway between the freezing and boiling point of water, although in solution, as in the blood for instance, the coagulating point is much higher.

Mr. Maynard said from experiments he had made with milk, he concluded that it coagulated at a higher temperature than now stated.

Dr. Parmelee reminded the last speaker that albumen is not found in milk. The casein of milk closely resembles both fibrin and albumen, and is readily converted into them by the digestive process. Casein is not, like albumen, coagulated when heated.

WROUGHT IRON GIRDERS.

William Fairbain, F. R. S., read before the Royal Society, February 4, a paper entitled "Experiments to determine the effects of impact vibratory action and long continued change of load on wrought iron girders," in which he describes his experiments to determine the strength and form of iron tubular bridges, also to show the extent of strain to which an iron girder may be subjected. His apparatus was designed to imitate as nearly as possible the strain to which bridges are subjected by the passage of heavy trains, by lowering the load quickly upon the beam and by producing a considerable amount of vibration. The test girder was a wrought iron plate beam twenty feet long. Upon it a weight was allowed to fall at intervals of about eighty per minute, day and night, by means of a mill driven by water power. The conclusion drawn from these experiments is that wrought iron girders are not safe when subjected to violent disturbances equivalent to one-third of the weight that would break them, but when they are equivalent to one-fourth of the weight the tenacity is unimpaired.

In the brief discussion on this item Mr. Stetson said he esteemed the matter mainly for its attempt to give the exact degree of strains which begin to be destructive. The fact that great strains approaching near the breaking point would, if continued under such conditions, impair the character of the material, was generally acknowledged.

Mr. Garvey alluded to the fact that constant vibratory motion tends to disintegrate wrought iron, by producing a crystalline arrangement of its atoms.

Mr. Fisher said it was the opinion of the late I. K. Brunel, of England, that the peculiar molecular arrangement described by the last speaker was produced by the blow which caused the fracture, and was not the result of previous tremulous motions.

Mr. Stetson was willing to believe that the rapidity of the act might greatly affect the appearance of the fractured surfaces, but agreed that the doctrine would be productive of evil if carried to the extreme of supposing that there were not great actual differences in the structure of metals. He instanced as common the cases of axles, which after breaking showed that the bars of which they had been formed were far more fibrous than others piled in the same axle. The great mass of cast iron cooled some years ago at the Novelty Works, before it could be poured, was broken open in the slowest manner by very tapering wedges, but its interior was in large crystals, and its exterior in fine. This is due to the fact that the outside was cooled rapidly and the inside very slowly. The manner of breaking could not have affected the molecular arrangement.

New Drawing Rollers for Spinning Machinery.

W. Wield, of Manchester, lately explained before the Mechanical Engineers' Society his improvement in fluted rollers, which consists in forming the flutes spirally on the rollers at an inclination of one in 12 to the axis of the roller. The fluting is made by giving a twisting motion to the roller while in the act of cutting. The diameter of rollers depends on the length of the cotton fiber. The length of the New Orleans and African cotton fiber is from one inch to $1\frac{1}{4}$; the Brazil from one inch to $1\frac{1}{2}$; the Egyptian from one inch to $1\frac{5}{8}$; American Sea Island from $1\frac{1}{2}$ to $2\frac{1}{8}$ inches. The cotton from the new sources of supply—East India and Nanking—now being introduced has a much shorter length, ranging from five-eighths to one inch. For the purpose of drawing this cotton, which is done by passing it between two pairs of rollers, the second pair having a greater speed than the first, it is requisite that the diameter of the rollers should not exceed three-fourths of an inch, in order to bring the two pairs of rollers near enough together to deal with fiber five-eighths of an inch long. The lengths of these rollers are from 16 to 22 inches, and they are coupled together so as to extend in a right line from 30 to 120 feet, and are driven from one end. Wrought iron is not satisfactorily applicable to rollers of such small diameter, for in addition to the weakness of coupling there is an amount of torsion which causes the time of action to be sensibly different at the two extremities. The slower delivery at one end gives an undue stretch upon the yarn and breakage is the consequence. Steel rollers will obviate the difficulty. The high price of the ordinary steel induced Mr. Wield to try the Bessemer steel. It is found to be suited to this purpose. Its cost is about $125 per ton.

Utilization of Seaweed.

Mr. E. A. Wunsh read a paper upon this subject before the Philosophical Society of Glasgow, and illustrated it with chemical tables and specimens of plants. He stated that about 10,000 tons of "kelp" are produced annually, and that it could be produced in much larger amount if the climate did not interfere with the drying process. One authority estimates the quantity of weed thrown up annually at 21,000,000 tons, of which not

1,000,000 is used for kelp and green manuring. It is proposed to dry it by the process for burning "wet fuel," by which the weed itself will furnish nearly all the requisite heat.

SURFACE CONDENSERS.

The selected subject for discussion, "Surface Condensers," was then taken up. The Chairman said that in the two previous discussions on this subject, all the novel and prominent features of this kind of condensing apparatus, as applied to low pressure steamers, had been fully illustrated; it only remained to examine those which have been used on high pressure engines, and to investigate more clearly the causes which are said to destroy very rapidly the boilers supplying steam to such engines.

Mr. Bartlett proceeded to briefly describe the arrangements used for surface condensation in high pressure steamers—not for the purpose of producing a vacuum, but only when it is quite important to use, during comparatively short voyages, fresh water in the boilers. Such condensers, in several government vessels lately constructed to navigate shallow waters, consist merely of tubes running outside of the vessel, near the bottom. They are properly protected from injury, but are in direct contact with the water, which is changed by the progress of the vessel, so that condensation is effected without pumping into the vessel cold water.

Mr. Root explained the construction of a surface condenser for high pressure engines, the essential characteristic of which is the use of a comparatively small surface, which is kept cold by dashing against its outside a powerful stream of water.

Mr. Stetson explained the principles on which several inventions in this line had been based, of allowing a portion of the steam to blow out through the condenser, or through a suitable passage, and condensing only the remainder. It was of course inapplicable to the great mass of merchant steamers on the Atlantic coast, and regular seagoing steamships as usually constructed, because in such the expansion of the steam was generally carried to such an extent in the cylinder, that at the end of the stroke the pressure was below that of the external air. But on the western rivers, and on many of the recent varieties of sea-going craft, when high steam is carried, and only a small degree of expansion used, the steam is discharged at above atmospheric pressure. If this steam is taken entirely into a condenser, whether jet or surface, it will require more cold water to condense it than if all the surplus above atmospheric pressure were allowed to escape uncondensed, and the remainder treated in the usual manner Mr. Joshua Lowe, an inventor, well known in connection with pressure-gauges, had an engine running in this city, near the foot of Delancey street, in 1852, with an ingenious provision of this kind, but it was objectionable by reason of the noise, caused by the violent closing of its self-acting valves. The patent office had evidently been ignorant of this, and several other experiments, because a patent had been issued within a few years, seeming to cover that general mode of operating. The patent never would have been sustained on such a broad construction, and he considered the field open to inventors. All the efforts down to the present time at improvement, had proved abortive.

Mr. Sewell said that his father had early planned an improvement on this mode, by introducing a positive motion for opening and closing the valve by which the steam escaped. The escape of a cylinder full of steam is almost instantaneous, and there is some difficulty in obtaining any practical advantage by letting a portion of the steam escape into the air.

CORROSION OF BOILERS.

The Secretary then directed attention to the effect of surface condensers on steam boilers, by reading the report of a late discussion before the Mechanical Engineers' Society, England, on this subject. Mr. James Jack, of Liverpool, had undertaken to investigate the causes which produced the rapid destruction of boilers, and gave an account of experiments made on the boilers of a steamship using a surface condenser. An examination after the first voyage, during which only distilled water had been used for feeding the boilers, showed the following effects, which were increased in every subsequent voyage, until the practice was adopted of feeding with, say, from one-sixth to one-tenth of salt water. First above and below the water line, the surface of the plates, tubes and rivets, were covered with a deposit resembling hydrated oxide of iron, which, when the water was evaporated, was in a state of fine, impalpable, brownish colored powder. This deposit was thickest above the water line, sometimes averaging three-quarters of inch thick. When the boilers were emptied, a thick, slimy deposit adhered all over the inside, an analysis of which showed that it consisted of

Oxide of iron	77.50
Moisture	19.75
Grease	0.85
Sulphate of lime	0.80
Oxide of copper	0.60
Traces of alumina, chlorides of sodium and magnesium	
Loss	0.50
Total	100.00

Secondly: Underneath this deposit the plates and tubes were found to be eaten into, indented, or "pitted." The indentations varied in diameter from the smallest speck to five-eighths of an inch, and in depth from the merest impression to the entire thickness of the plates or tubes; and although they were found all over the boilers, they were most numerous just over the fire plates. So destructive was this pitting in boilers using the same water over and over again, that in one instance the tubes of new boilers were actually eaten through at the end of two or three voyages, extending over only a few months altogether, and it became necessary to put in new tubes, and to use a portion of salt water for feed, to keep up an incrustation, so that the boilers should not be acted upon. If the iron of the boilers had all been of one make, it would naturally have been concluded that the pitting was due to the quality of the iron; but the iron had been obtained from different makers, and was of the best quality. The presence in the boiler of a soft metal—such as copper from the condenser tubes—it was considered would induce such galvanic action as might affect the iron. But the analysis showed there was scarcely a trace of foreign metal there. The tubes of the condenser and copper pipes were all in perfect condition. Even at the joints, made tight by india rubber, hardened by vulcanizing, there was hardly a speck of corrosion.

A search was then made to ascertain whether the gluey deposit was present that arises from the decomposition of tallow and oil used, and without success. In case a fat acid might be the cause, pieces of chalk were put into the boilers, and from time to time fresh pieces were added; carbonate of soda was also mixed with the feed water in regular doses, but all to no purpose; the action went on, getting worse and worse. The practical knowledge thus acquired necessarily led him to the conclusion that the distilled water itself was the cause of the corrosion, instead of galvanic action or any fatty acid. In reference to the question whether distilled water has any particular action on metals, the chemist Berthier found that nodular protuberances deposited on iron pipes containing distilled water, consisted of twenty-one per cent. of protoxide of iron, fifty-eight per cent of peroxide of iron, five per cent. of carbonic acid, fourteen and a-half per cent. of water, and one and a-half per cent of silica. The iron pipes contained also a pulverulent substance, which could be produced at pleasure with distilled water, to which a trace of carbonate of soda and common salt had been added, but not with the addition of caustic alkali. Mr. Ramsbottom stated at the same meeting that he had found similar effects in using peat water, which was almost as pure as distilled water. Both he and Mr. Markham had found carbonate of lime would prevent corrosion. Mr. Gray thought the corroding was due in locomotives to the brass tubes, used in England in such engines, for on examining the pitted plates with a microscope, he had found a minute speck of brass in the centre of many "pits." Mr. Rollo did not concur in this opinion, if applied to boilers in connection with surface-condensers; but thought it just possible that the fatty matter contained in the grease had something to do with deteriorating the quality of the water, and causing its corrosive action.

At the conclusion of the reading of this abstract, Mr. Sewell restated some of his views expressed at a former meeting.

Dr. Parmelee inquired whether sulphuric acid was not employed in preparing the lubricating compounds used, and suggested that the presence of a small quantity might originate this corrosion.

Mr. Vedder stated that the acid was not used in preparing the tallow, but it was largely in refining coal oils and petroleum.

Mr. Griffin, a practical engineer, said he had found the tubes of two high-pressure boilers, placed side by side, eaten away. One had iron pipes leading to it, and the other copper. The tubes were corroded both above and below the water line. This evidence bears strongly against the supposition that the cause is galvanic action.

The further discussion showed that in the surface-condensing apparatus and boilers used in this country, no serious effects have been observed when the copper tubes of the condensers are tinned and a small quantity of salt water is used in the boiler.

After selecting the subject of "Iron" for the next discussion. the Association adjourned.

American Institute Polytechnic Association,
March 24, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

During the hour devoted to the examination of new inventions and discoveries, the Chairman read the following interesting summary:

Bodily Work and Waste.

Under this title, the *Popular Science Review* illustrates the great truth, established by modern research, that every manifestation of physical force involves the metamorphosis of a certain quantity of matter. Its facts regarding the daily work performed by the ordinary human being are chiefly furnished by the investigations of the Rev. Prof. Haughton, of Trinity College, Dublin, who asserts that there is a definite relation between the amount of force exerted and the amount of urea generated. The urea formed daily in a healthy man, weighing 150 pounds, fluctuates from 400 to 650 grains. Of this 300 grains are the result of vital work; that is, of force expended in the motions of the digestive organs and the heart, and in sustaining the temperature of the body at a uniform rate. This amount exceeds all other force generated and expended in the system, and is equal to that required to raise 769 tons one foot high. In addition to the mere act of living, the working man undergoes bodily labor equivalent to lifting 200 tons one foot high daily, which requires the formation of 77.38 grains of urea. The force expended in two hours hard mental labor involves an expenditure of power equal to lifting 222 foot tons, and a generation of urea weighing 86 grains. Thus we have the total formation of urea during twenty-four hours amounting to 463.38 grains, for which there is expended force equal to 1,191 foot tons.

The Chairman added: Urea is a colorless substance which by slow evaporation crystalizes in four-sided prisms. It consists of two atoms of carbon, two of nitrogen, two of oxygen and four of hydrogen. Its rational formula has not been definitely settled. A little more than forty-six per cent by weight consists of nitrogen. It is through this important compound that nearly all the nitrogen of the exhausted tissues of the body are removed. According to Becquerel, there is an excess of urea formed in the male sex in the ratio of 17 to 15. Although the amount depends somewhat on the nature of the food, Lehmann discovered long ago that strong exercise of the bodily powers increased its excretion. Urea was first made artificially from inorganic substances by Wöhler. By the addition of two atoms of water, urea is changed to the carbonate of ammonia, and thus becomes a valuable fertilizer.

Soluble Blue Dyes.

Mauve and other color compounds of the aniline class obtained from coal tar are but slightly soluble in water. M. Clavel has patented in France a process for rendering them more soluble. He dissolves the dye in forming sulphuric acid, and then pours the solution into water, through which a current of steam is passed. It is then precipitated by an alkali or common salt. The coloring matter, which collects in flocculi, is washed and dissolved in boiling water, and is then ready to be used in dyeing.

ORBITS OF BINARY STARS.

Prof. Kirkwood, in Silliman's Journal for March, directs attention to the fact that the orbits of binary stars, so far as observed, are much more elliptical than those of the planets. Of the whole number of apparently double stars known to us, about 6,000, no less than 650 have changed their relative position. The almost circular path of planets around the sun and the extremely elliptic motions of the self-luminous stars are both accounted for by the theory of Laplace, as explained by Prof. K. For if a mass of nebulous matter in which the process of condensation has commenced, has a very slow rotation, and if, instead of a single center of attraction, two distinct nuclei be formed, the consequence may be its complete separation into two bodies, while the rotation is yet so slow that the centrifugal force, as compared with the centripetal, is too feeble to produce a nearly circular motion. While, therefore, orbits of small eccentricity must characterize planets formed from the abandoned equatorial rings of a condensing nebula, orbits highly elliptical may be regarded as the probable consequence of a separation in the earlier stages of its physical history.

WATSON'S COMET.

Mr. Watson, of Ann Arbor observatory, communicates to Silliman's Journal the elements of the orbit of the new comet discovered by him on the 9th of January, which almost exactly resemble those of the comet of 1810. This comet was barely visible to the naked eye in the latter part of January, and in a comet seeker exhibited a tail about two degrees in length.

PROGRESS OF THE WORLD'S TELEGRAPH.

The Russian telegraph line in the direction of America is now complete from Omsk to Irkutzk. Dispatches from St. Petersburg reach Irkutzk, a distance of about 5,750 versts, in less than one day. Letters transported between these places are twenty-four days on the route. The Russian verst being equal to 3,501 American feet, the whole length of the line completed is 3,815 miles.

STEEL RAILS.

From experiments on the London and North Western railway, it is concluded that one pair of steel rails will last as long as ten pair of iron rails, subjected to the same amount of wear.

THE GREAT TRUNK RAILWAY.

A project has been started to construct a railway underground from the Battery to the northern extremity of Manhattan Island. The act to authorize a company for this purpose, with a capital of $5,000,000, is now before the legislature. It names as corporators some of the most prominent and wealthy gentlemen of New York. The route has been pronounced feasible by competent engineers. A similar underground railway in London, extending five miles, is said to be a success.

Without entering into the details of this project for tunneling New York, which follows the trial and abandonment of a short tunnel in the city of

Brooklyn, it may be proper to inquire whether the objects desired by this company may not be more readily and cheaply accomplished by another plan.

AN ELEVATED RAILWAY.

Mr. John Randall proposed, many years ago, to construct an elevated railway over the sidewalks of Broadway; but the plan now proposed by the Chairman is to construct a railway especially designed to carry passengers with great rapidity from the upper end of the island to the lower, so that persons living above the Central Park, for instance, could reach their places of business in the time usually devoted to that purpose by those living below Union square.

The railway should be constructed, for this object, between two main avenues or streets, taking the back part of the lots fronting on either avenue. It should be at least 20 feet high, and pass over all the cross streets leading to the North and East rivers by bridges without any supports in the streets. It would pass through the second and third stories of one building on either side such streets, the first or main floor of which could be occupied as a store. In fact, the whole line, except when it crossed a street, would form a continuous series of compartments, which could be rented for enough to pay the interest of the cost of the ground occupied by the road. The advantage gained by this plan would be the securing of natural light and pure air.

To properly light and ventilate a tunnel would require a constant expenditure of an amount of money larger than would at first be supposed. The use of steam involves the generation of large quantities of carbonic oxide and carbonic acid gases which could not be entirely removed by the best devised plan. Compressed air, as a motor, would remove all objections regarding ventilation, but it would double the cost of transportation.

It requires but little foresight to predict that this great metropolis must soon require such facilities as either of these projects could furnish for reaching within a comparatively short time the business centers of the city. This timely attempt to provide for the future by a powerful company, should be a matter of general congratulation, and it seems proper that the charter should also embrace the project now proposed, so that, after careful surveys and estimates they may decide whether to carry the class of passengers requiring a rapid transit, underground or overhead.

Mr. Fisher thought favorably of the plan proposed by the Chairman; it was feasible to construct the proposed railway between the avenues.

Dr. Parmelee could see no serious objection to the underground railway; certainly those above ground would be less incommoded if passengers were transported in this way.

Mr. Dibbin said that it would be well to bear in mind the fact that a tunnel was constructed a few years ago in London under the river Thames, but it was never used by vehicles, and nobody visited it now except to examine the structure. The same result would follow in New York; people would not consent to ride underground when they could have the light of day. The most feasible plan was to lay the rails in the streets. A serious objection in the minds of some would be that there are no interesting engineering difficulties in the way. There has always been a hankering after something very difficult in order to engage popular attention. Within five years we shall have a railroad in Broadway, and we will then look upon it, as we have at the steam fire engine, and wonder why it had not been introduced before. The greatest objection to street railways is the high fare. A passenger can be carried for three cents and the companies would pay a fair dividend.

The Chairman enquired whether any gentleman present had been in the London railway tunnel?

Prof. Joy, of Columbia college, stated that he had made a passage through a portion of the railway tunnel alluded to. It was very comfortable and pleasant. The tunnel appeared to be amply ventilated and lighted. At every fifth or sixth block there were openings for the ingress and egress of passengers.

Dr. Parmelee said the great point to be gained was expedition. People could not be carried fast enough.

Mr. Bartlett suggested that this point might be attained by the use of the pneumatic tube.

This plan had been discussed at a previous meeting. After some further observations from Mr. Adriance and others, it was decided to take up the question again.

GEOLOGICAL.

Dr. Stevens illustrated, with the aid of diagrams, the peculiar movements which have taken place in the great upheaval, producing the mountain system, from the Atlantic coast to McKeon county, Penn. The range through which the Potomac river passes was particularly noticed. The coal formation, the Devonian and the Upper and Lower Silurian systems, were pointed out. The same strata of coal in the valleys were found on the tops of the mountains. Faults occurring at various points through which the river passed were shown; these cannot be explained without diagrams. The speaker was listened to with evident satisfaction.

IRON AND ITS APPLICATION TO WAR VESSELS.

The Chairman, in announcing the selected subject for discussion, stated that Mr. Charles W. S. Heaton had been invited to address them, and he would probably devote part of his remarks to the proper use of iron in building ships of war.

Mr. Heaton, after some preliminary remarks, directed attention to the nature and peculiarities of iron. The three most important varieties are cast iron, hammered iron and rolled or bar iron.

Cast iron is a crystalline metal, having comparatively little tensile strength, but presenting great resistance to compression. It is made malleable in small castings by being subjected to long continuous heat, which blends together its crystals, thus rendering it tougher and less brittle. The surface of cast iron is made more hard but brittle if it is poured, when melted, into damp molds, producing what is called chilled cast iron.

In hammered and rolled iron the crystalline arrangement is entirely destroyed. Its material becomes fibrous and more dense. One variety of iron made by the hammering process is known as homogeneous iron.

After further remarks on the constitution of iron the speaker directed attention to its use in the construction of vessels of war, and examined the different systems of iron armor now in use. There are two prominent systems—one using a plate of great thickness, called the solid-plate system; the other using a series of thin plates, called the laminated system. The only reason why iron is better adapted to resist a shot or projectile is that it is more dense, not that it is tougher than any other material. Iron is not so well adapted to resisting a sudden shock as wood is, taking equal weights of each. For instance, take a plate of iron one foot square and one inch thick, weighing about forty pounds, and a piece of timber one foot square, and of such thickness, or rather length, as to weigh the same as the iron plate. Strike each with a hammer having the same degree of force; the result will be that an indentation will be made in the iron plate, and there will be a bulge or projection upon the opposite side, proving that the fibrous strength of the iron was not sufficient to resist the force and spread it equally throughout the plate; while on the other hand the wood will be dented where the hammer struck, but there will be no corresponding bulge on the other side.

To the late Robert L. Stevens, of Hoboken, N. J., doubtless belongs the credit of proposing and partly building the first iron-clad vessel for resisting projectiles. His plan was not so much to stop the shot, as to change its direction, by causing it to glance. The Merrimac was built with the same design. The same idea is carried out in the construction of the turrets of the monitor class of vessels; but it has been found by experience that a shot is not altogether ineffective which strikes but does not penetrate the armor. It has not yet been proved that vessels of this class can make a sea voyage.

Angular armor has no advantage which outweighs the disadvantages attending it. For instance, suppose the hight of six feet to be plated and set at an angle of forty-five degrees, the surface will be nine feet, but this position of the iron does not accomplish the end intended, for a shot fired from a long distance will fall nearly perpendicularly on such a surface. The French were the first to attempt to practically resist the force of shells fired from bombs. But the Russians were the first to inaugurate the mode of horizontal shell-firing, by which they destroyed the Turkish fleet in the Black Sea. The effect of this system of firing had been prognosticated by Admiral Dahlgren, and the Dahlgren gun was specially adapted to this mode of attack. The increased destructive power of guns and projectiles has caused a corresponding increase in the projectile armor. The question now remaining is, whether the ship can be protected without destroying her sea-worthiness. This brings us to the examination of the best mode of resisting shot.

If a body of a given weight and hardness meets another like it, and having the same velocity, the damage is mutual; but if it meets one like it which is stationary, the latter will be most injured, and will at the same time receive the momentum. But if the moving body is brought in contact with a stationary one of sufficient hardness, having a weight so much greater as to absorb the momentum, the result will be different. If the velocity of the moving body is low it will on striking rebound; but if the velocity is high it will be shattered in pieces, and the resisting body will be broken also, at the point of impact. Now, suppose the stationary body has less hardness, the moving body will penetrate it, but with a constantly decreasing speed, because its motion is being transmitted to the yielding substance. A force capable of producing fracture may be transmitted through a hard substance to a soft one, but not through a soft to a hard substance. If we apply this principle to the armor of a ship we shall see that the most efficient mode of resistance would be not to place iron outside of wood, but to reverse this position. This principle had been tested at the request of the speaker by the Department at Washington, and was soon after substantially adopted in the construction of the Government vessel Onondaga, by Mr. Quintard, at Greenpoint. Some have condemned the plating advocated by the speaker, principally on the ground that shell would blow it off. He therefore proposed to meet this objection at the next meeting of the Association.

The Chairman directed attention to the term homogeneous iron, used by some English manufacturers. It is not a proper term to use in that connection, because the quality of the iron, even in the same mass, will vary. It may be that by the peculiar process of working blooms, a greater uniformity of texture can be secured than is found in ordinary iron, but the very fact that large masses must be made up from smaller ones, forbids the use of that term in its true signification, as applied to iron.

Mr. Bartlett alluded to the experiments showing that iron is stronger in the direction of its rolling.

Mr. Dibbin said that the best iron used in this country is the American charcoal iron. It is claimed to be manufactured entirely with charcoal, but in most cases about fifty per cent. of anthracite is used, and probably with little or no detriment to the quality of the metal. The value of the different qualities of iron has been fully tested by the late Robt. L. Stevens, of Hoboken, and his brother. This was a preliminary step in their construction of an iron-clad ship. The homogeneous metal spoken of is rolled, as well as hammered. It is simply a mild steel. It is piled together in small blooms, and is consequently of a more uniform quality.

Mr. Disturnel believed the quality of iron depended more upon the quality of the ore than the manner of working it. He read a statement of Prof. Johnson with regard to the comparative strength of iron made from different ores, and spoke of the great tensile strength of the metal made from Lake Superior ores.

Remarks, for which we have no room, were made by Messrs. Garvey, Fisher, Parmelee, Heaton and Bartlett. The discussion of the same subject is to be continued at the next meeting. Adjourned to Thursday evening, March 31st.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
March 31, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

The following interesting summary of scientific intelligence was presented by the Chairman ;

INTENSITY OF SOLAR RADIATION.

Father A. Secchi has communicated to the *Comptes Rendus* his observations on the intensity of solar radiation at different seasons, from which he draws the following two conclusions: 1. That in the summer, the radiation in the meridian is greatly enfeebled by aqueous vapor, so that without it, we should have double the radiation. (It would be necessary to verify this for high mountains, which would be well worth the trouble.) 2. That the absorbing force of vapor is very great, for we see that a quantity of seven to eight millimeters, in excess, in the summer, produces an absorption equal to that of the entire atmosphere of gas in the winter, which would give for the vapor ninety-five times that of the air. But if allowance is made for the greater elevation of the vaporous layer in the summer, and for the phenomenon of thermochrose, which causes the first layer to absorb more than the following, it must be admitted that Prof. Tyndall's result, which makes it sixty times as much as air, is not far from the truth.

BLEACHING SPONGES.

The process of Mons. Artus, is to first wash the sponges with a warm and dilute solution of caustic soda; afterward with warm water. They are then plunged into a bath consisting of a dilute solution of hyposulphite of soda, and some dilute hydrochloric acid. When sufficiently bleached they are taken out, well washed and dried.

The Chairman remarked that sponge is the skeleton of a zoophite. Its chemical constituents are one atom of iodine, three of sulphur, five of phosphorus, and twenty of fibroin. The latter substance is found in the secretions of the silk-worm and spider, and consists of thirty-nine atoms of carbon, thirty-one of hydrogen, six of nitrogen, and seventeen of oxygen. No substance resembling fibroin has been found in the vegetable kingdom, and for this reason the sponge is generally classed among animals by naturalists, although a few still regard it as a plant.

PEARL OYSTERS.

The three most important pearl fisheries are in the Persian Gulf, in the channel between Ceylon and the main land, and the Tenevelly banks opposite the Gulf of Manaar. The pearl fisheries have been known from time immemorial. *The London Intellectual Observer*, in an article on the last named locality, says: "The pearl oyster is not, in reality, an oyster at all, but is more allied to a mussel, having a byssus or cable by which it secures itself to the rocks, one of the most important points in its organization. The animal's foot is composed of a series of muscular films, and is two and a half inches long when distended. On the lower side is an exact mold for the formation of the byssus. When the animal desires to attach itself to a rock, its foot is protruded, and after seeking a suitable spot, the tip is still for some minutes, and then retracted into the shell. A strong fibre in the form of the groove is left attached to the base of the foot at one end, and to the rock at the other. This process is again and again repeated, until a strong cable is formed. The animal can cast off this cable, and reform one at pleasure, when in good health. Its food consists of foraminifera, minute algiæ and diatoms. Dr. Kelaart has suggested that the siliceous internal skeletons of these microscopic diatoms may possibly permeate the coats of the mantel, and become nuclei of pearls; another supposition is, that the ova escape from an overgrown ovarium, and are the origin of the gem.

A single oyster of five or six years' growth, contains 12,000,000 of eggs. A plan for cultivating the pearl oyster is now being tried by transplanting them as we do the edible oyster.

VALATA.

This tree, growing in Guiana, yields a juice which is used by the natives instead of milk, in coffee. M. Serres states that this juice is capable of being worked into a product much more flexible than gutta percha, and in every way superior to it.

The reading of this item brought to the floor Dr. Parmelee, who stated he had eight samples of Valata product, but as yet had only examined its physical properties. It is not softened by immersion in hot water. It can be vulcanized, and seems intermediate between India-rubber and gutta-percha. There is no difficulty in obtaining it in large quantities.

Some gentlemen present having expressed a doubt about its being used in coffee, the Chairman remarked, that Valata juice was evidently a hydrocarbon, and might be digested in its normal state. Gum, starch and cellulose, the substance of the vegetable cell, are isomeric compounds, containing an equal number of oxygen and hydrogen atoms, and are sometimes distinguished as carbo-hydrates, yet these three substances differ widely from each other. Gum and starch can be digested, but we are not certain that any animal except the beaver can digest woody fiber.

PRESERVATION OF ANIMAL MATTER.

A method was described before the French Academy by Mons. Pagliari. The substance to be preserved is covered with a mixture of alum and gum bezoine, with water, which forms a layer of varnish over the surface of the substance, thus excluding the air, and completely preventing its decomposition.

A NEW LANTERN POLARISCOPE.

Mr. Samuel Highley, of London, has invented an instrument to be used in connection with the magic lantern, much cheaper than the gas polariscopes. To use this instrument the front lenses of the magic lantern are removed, the condensers only being employed, and the source of light removed until a beam of parallel rays is produced. The lantern nozzle is then pointed at the "bundle,"—consisting of a number of thin glass plates—till the rays are incident to the polarizing angle for glass, the proper adjustment of parts being indicated by the appearance of an even disc of light upon the screen. A design is then inserted in the large stage, and its lines of construction focused. The analyzing prism is then placed in front, sustained by an adjustable rod, and the colored effect produced and varied either by the rotation of the prism or the rotation of the design or crystal.

The absolute field of color attainable by the prism is dependent upon the intensity of the light.

Testing Oils by their Cohesive Figures.

Chemistry having failed to detect some admixtures of oils, Mr. C. Tomlinson has had recourse to a physical test, doubtless suggested by the researches of Savart, which he described before the London Pharmaceutical meeting of last month. The test depended upon the forces of cohesion, adhesion and diffusion. A drop of the liquid to be tested was carefully dropped upon chemically pure water in a chemically clean vessel. The force of adhesion endeavored to spread the oil in a thin film over the surface of the water, the force of cohesion endeavored to prevent this, and from the contest of these two forces there resulted figures which the author believed to differ in the case of every independent liquid. There might be instances of two or more liquids differing in chemical composition but having the same physical properties, where the figures would be identical. Such cases, however, must be rare. The oil must be dropped from a rod that has been made perfectly clean by being washed with strong sulphuric acid, rinsed in water, then washed with caustic potash, and again rinsed with water. The rod should be held only about one-tenth of an inch from the water when the oil is dropped.

The figure produced by castor oil is of great beauty. As soon as this oil is dropped, it spreads out in a series of rings, magnificently irridescent. Outside there is a silver corona, which breaks up into a delicate, lace-like pattern; this appearance lasted for some seconds. The figures of the fixed oils are more durable. Mixtures could be easily detected, as the figures produced partook of the characters of both the constituent oils, yet resembling the proper figure of the oil which is in excess. A mixture of lard oil with castor oil is best shown in what may be called the residual phenomena, the lace-like patterns being scattered over with numerous small blotches. Croton oil gives a magnificent figure of large pattern, and a mixture of five per cent. of this oil with castor oil may be readily detected by the practiced eye. Turpentine gives a remarkable figure; the film flashes out immediately almost to the edge of the vessel; the outer circumference is dotted with numerous small bosses, which are larger within, and enclose patches of irridescent colors. The figure produced by balsam copaiba was a magnificent sight. A succession of rings were thrown out showing beautiful colors and a metallic luster. A mixture of balsam and castor oil gives neither colors nor pattern. In conclusion Mr. Tomlinson said he did not look upon the investigation as complete—he believed the figure of every pure liquid would serve for its verification, as the form of a crystal led to the identification of a salt.

New Facts in Fermentation.

M. A. Bechamps states in the Comptes Rendus that if the must of grapes of different kinds is filtered, the ordinary alcoholic ferment (yeast) only appears on it; but if not filtered, thread-shaped ferments make their appearance also, and occur largely with the free access of air. The filtered must yields a wine that differs considerably from that of the unfiltered grape juice made in the ordinary way.

SHOOTING STARS.

M. Poey, in a paper to the French Academy, states that from observations made at Havana, the number of shooting stars in the Northern Hemisphere is double those in the southern. The maximum number of meteors are seen in the northern between 1 and 2 o'clock, in the southern between 2 and 3.

ARTIFICIAL RAINBOW.

The Cosmos speaks highly of J. Duboscq's contrivance for imitating a rainbow in a French theater. He employs an electric light made by 100 Bunsen elements. Its rays are transmitted in a parallel direction by means of a lens, through a slot in the form of an arc to a double convex lens of very short focus, from which the rays pass to a prism and emerge with sufficient divergence to make an effective rainbow, during the ordinary illumination of the stage, on a screen 18 or 20 feet distant.

UNEQUAL POWER OF THE ORGANS OF HEARING.

In making experiments with tuning forks, by holding one to each ear at the same time, Herr Fessel, of Cologne, has discovered that ears do not possess an equal power of hearing. It appears that from numerous trials on various individuals, they hear best with the right ear, but in no case has the hearing been found exactly alike on the two sides of the head. The difference in the sight of the right and left eye is also more common than is generally supposed, because the impression made by the weaker eye is absorbed or dissipated by that of the stronger eye, which has generally been made stronger by previous use, the practice being common to favor one eye.

This item gave rise to an interesting and spirited discussion, in which Messrs. Nash, Gavit, Parmelee, Rowell, Roosevelt, Bartlett and Garvey participated.

STEAM PRESSURE GAUGES.

Dr. Warren Rowell, from the committee to examine a new Mercury Steam Pressure Gauge, submitted the following report:

The committee to whom was referred the Mercury Pressure Steam Gauge of Messrs. Shaw & Justice, respectfully report:

That a correct instrument to indicate the precise pressure of the steam within the boiler of a steam engine, is of the first necessity. Ever since the use of steam, above the atmospheric pressure, various devices to shew the exact pressure have been invented. A brief sketch of the most important is herewith presented. The first one was Papin's safety-valve, which was simply a heavy plug of metal fitting an orifice in the cover of the kettle now known throughout the world as Papin's digester. This metal plug was lifted by the pressure of the steam, when above the temperature desired, and of course when the pressure went down the temperature went down also. This invention, (says an old author) without which steam would long ere this have been abandoned, as a dangerous and ungovernable agent, entitles Papin to universal admiration, since it has contributed more than any single addition or improvement to the maturity of the steam engine. The next advance was by Henry Brighton, of Newcastle upon

Tyne, the lever and weight, (or as it was then called the steel-yard) was added to the safety valve of Papin, and this arrangement has never been improved, and in exactly this form is an essential part of every steam-boiler at the present time. But still there was wanted some instrument that would show the varying pressures before the safety-valve was lifted. Mr. Wolf, the inventor of the high and low pressure engine, added to the stem of the safety-valve, a quadrant that acted on an arm, like one arm of a governor : but it was too complicated to answer any common purpose. At what time the siphon mercury gauge was introduced is not mentioned in the history of the steam-engine, but an old engine builder, familiar with steam-engines in England, says he has seen them on old engines constructed before Watts's time. The siphon gauge, for a limited pressure, is all that is needed, and is universally in use for low pressure at the present time. The mercury column is in fact the true measure of all pressures up to hundreds of pounds, but for such pressures the great height of the mercury column is too unwieldy for ordinary purposes. The other gauges in use now are the mercury and air gauge, in which the air acts as a spring, by compression, and the metal spring gauge. The mercury and air gauge when properly made and in good order is up to the pressure of 80 lbs., quite practical, but above that pressure the scale becomes so contracted that it requires the closest inspection to observe the pressure indicated. The metallic spring gauges are on various plans, involving the same principle, that is, some elastic metal that yields to pressure in connection with some gearing and a dial and pointer. Each gauge is marked by a mercury and air gauge as a standard. But the spring becomes gradually weakened by the constant pressure, and unless frequently tested they become very unreliable. To be sure, they err on the safe side, for boilers with steam in them ; but when a metal spring gauge is used, with a force pump, for testing a boiler, its imperfection may lead to disaster.

The gauge of Messrs. Shaw & Justice, which was referred to your committee, has been diligently examined, and its operation on steam boilers, at two different establishments, noted by some of the committee, from day to day, for a period of ten or twelve weeks. At the Metropolitan Mills, in this city, it has been constantly compared with a mercury and air gauge, and with a metal spring gauge. The pressures, indicated by the several gauges, varied from twelve to thirty pounds. At the highest pressure, they carry at the mills, which is between seventy and eighty pounds, the gauges differed thus:

Shaw & Justice's	71 lbs.
Mercury and air	83 "
Metal spring	101 "

On comparing them one day, when the mill was stopped for an hour or two, and the steam pressure in the boilers was allowed to run down, the gauges were noted at all pressures down to the following:

Shaw & Justice's	16 lbs.
Mercury and air	21 "
Metal spring	27½ "

The gauges varied at this pressure from five to eleven and a-half pounds. Another test was made, that of temperature and pressure, according to

Regnault's scale. A small vessel was used, capable of sustaining a pressure of one hundred and fifty pounds to the inch, with a thermometer attached. Each of the gauges were tried in succession; and, after two or three trials, the true pressure seemed to be the nearest to Shaw & Justice's. At the request of Mr. Shaw, one of your committee made a journey to Philadelphia, and compared the gauge with both the temperature and the column of mercury. The steam vessel used was capable of sustaining a pressure of three hundred pounds to the square inch. We could only make the comparison up to two hundred and twenty pounds, as the column of mercury was but forty-two feet in height. The height of the column was measured in feet and inches, and the gauge of Messrs. Shaw & Justice was found *perfectly correct with the mercury column.* The principle on which this gauge is constructed is a combination of the mercury column and piston with a difference of the area of the two sides of the piston on which the steam and mercury column presses, very much as the weight and lever added to Papin's safety valve. The greater the difference of areas the shorter is the mercury column, and unlike the mercury and air gauge, the scale is as open at the highest pressures as it is at the lowest. Too much credit cannot be given to Messrs. Shaw & Justice for the erecting of a mercury column (the only one of this height in this country), for testing and marking their gauges correctly. It is proposed to have one at the Metropolitan Police head-quarters, in this city, to try the gauges used by the boiler-inspectors of the Sanitary Police, and also to try such gauges as they find are out of order.

In conclusion, the committee would say, that they think the gauge of Messrs. Shaw & Justice the most complete and perfect of any gauge now before the engineering world.

WARREN ROWELL,
JOHN K. SIMPSON,
J. K. FISHER.
Committee.

NEW YORK, *March* 31, 1864.

The following illustration will give a clear idea of the gauge examined by the committee:

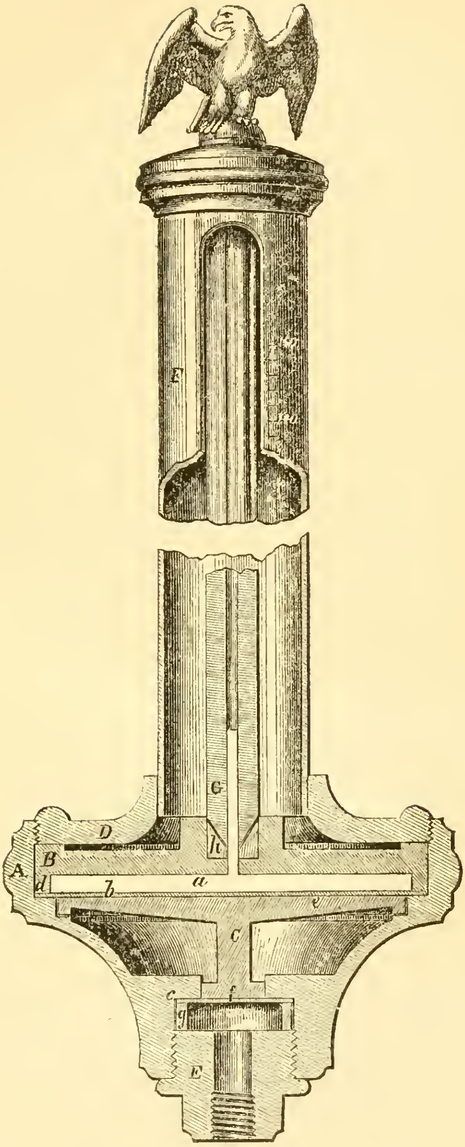
Description of the Vertical Section shown of Shaw & Justice's Patent Mercurial Pressure Gauge.—*A* is a brass cup containing the iron disc *B*, which is recessed on its lower side to form the mercury chamber *a*.

C is a double headed piston or plunger, with its upper and larger head covered by gum diaphragm *b*, and receiving the pressure of the mercury in the chamber *a*, and into which it passes when the pressure is applied on the small head of the piston *f*.

D is a cap screwing into the cup *A*, and impinging on iron disc or mercury chamber *B*, and the gum diaphragm *b*, thus making a perfectly tight joint at its point of contact *d*, and preventing any escape of mercury into the lower part of the cup *A*.

E is a jam-nut with an orifice (for the steam) which presses against a perforated button or ring *g*, which in turn impinges on gum diaphragm *c*, making an air and steam-tight joint at point of contact.

f is the lower and smaller head of the piston, which receives the steam pressure, and in its upward motion forces the mercury in chamber *a*, through



SHAW & JUSTICE'S Patent Mercurial Prepared Guage.

the small perforated aperture in the centre of disc *B*, immediately over which is the glass tube *G*, into which it rises to the point indicated by the register.

h is a gum ring or cushion to receive the conical end of the glass tube *G*, which is firmly pressed upon it by screwing on the top cap of the brass tube *F*.

It is desirable that this gauge should never be placed in a position where it can be heated to an extent which would destroy the gum diaphragm. The steam pipe should be sufficiently long and slightly curved or bent to allow the accumulation of water, so as to prevent the steam from superheating the body of the gauge. With these precautions it will prove *always true*, and may be said to be almost indestructible.

Mr. Fisher said that he had a simple and effective plan to propose for ascertaining the pressure of steam within a boiler. It was to raise the lever of the safety valve from time to time with an ordinary spring balance; the weight required to raise the lever as indicated by the Spring weighing machine, deducted from the known weight on the safety valve, will give the exact pressure within the boiler.

GUNS AND GUNBOATS.

Mr. Heaton took the floor by invitation and continued his lecture commenced at the last meeting. He exhibited a very complete model of a vessel of war constructed upon his design, and having a propelling power consisting of a spring with the requisite gearing. The model also embraced a plan for steering the vessel when under very slow motion by the rotation of a wheel whose axis is parallel to the keel. The guns in this model could all be fired on either side of the vessel; they were stationed near the central line, and were protected by zigzag bulwarks. The various kinds of guns in use were all explained by the speaker, and their merits and demerits fully set forth, after which he answered queries from Messrs. Dibben, Rosevelt, Garvey and Bartlett,

Mr. Justice gave an account of the late improvements made by Captain Parrott upon his guns, which consisted in the substitution of steel rings in the place of the iron bands formerly used.

STEEL.

Mr. A. L. Fleury, of Philadelphia, exhibited specimens of steel made by a process claimed to be new, which he fully explained. It consists in heating scraps of iron in crucibles or their equivalents to a high degree and then introducing into the crucibles oxyde of iron or other suitable substance containing oxygen, and immediately after pouring a quantity of melted pig iron into the crucibles. The amount of oxyde is so proportioned that any excess of carbon which exists in the cast iron above that necessary to form steel, will combine with the oxygen gas liberated from the oxyde and pass off with the products of combustion. By increasing the proportion of oxyde of iron the steel may be decarbonized to such an extent as to reduce it to wrought iron. It will of course be understood that the steel may be greatly varied in quality by the introduction of other substances in connection with the oxyde of iron, by using oxydes of chromium, tungsten, or titanium for producing hard steel, or by simply increasing the oxyde of iron and wrought iron for making soft steel. The apparatus used in the process was also explained, and that portion designed to economize heat by passing it successively around a series of crucibles was illustrated by diagrams on the blackboard. It was stated that the whole cost of making steel by this process is seven cents per pound.

In the course of his remarks upon the steel process, the Professor described an experiment made in Paris. It was found that when iron nails are heated to a white heat in a crucible, and the oxyde of iron was poured upon them, the iron was melted into a button.

An application of magnetism in the formation of steel as a part of the new process was also explained. When the steel is poured into a flask an electro-magnet is placed upon its side, with one hole at the top and one at the bottom of the flask. The current then passes through the molten iron, and by this operation the molecules of steel place themselves in perpendicular lines. By this means the position of the molecules can be varied relatively to suit any particular case. For instance, if a screw is to be formed, the crystalization can be made to correspond to it.

The Chairman remarked that the use of the oxyde of iron in combination with cast and wrought iron, in the process just described, is not new. The same combination had been made by a member of this Institute several years ago.

No discussion followed upon the feasibility of the method described, the members generally having previously expressed the opinion, that less is known about the forces controlling the formation of steel, than concerning those applied in any other department of manufactures.

Mr. Fleury then directed attention to the subject of

IRON.

We find that in the American iron there is a large percentage of silicon. It is usual to attribute the "cold-shortness" of iron to the presence of phosphorus, but it is, in fact, owing to the presence of silicon. We have in chemistry some substances which have a great affinity to silica; among these is fluor-spar—a very small percentage of this substance causes the silica to disappear in the manufacture of iron. Fluor-spar is used in English iron furnaces, and the speaker thought it was also used in the celebrated manufactory of Krupp, in Prussia, as the specimen which was analyzed by him was almost entirely free from silica. Another substance used for the purpose of abstracting the sulphur from iron is the barita—the oxide of barium—which unites with the sulphur forming the sulphide of barium. In the process of making steel, we mix charcoal and a small percentage of fluor-spar with some carbonate of lime—not burned lime. Some iron-masters do not seem to understand the effect of magnesian limestone which also produces the cold-short iron. Some of the rails made from this iron were found to be filled with small holes. The speaker said he had found a large percentage of iron in the cinders of furnaces, thousands of tons of which are thrown away. He had made more than a hundred experiments for the purpose of ascertaining the best mode of abstracting the metal. A feasible plan was to blow the cinders into the furnace along with the air-blasts. By this method, he obtained fifty per cent of the iron in them.

Mr. Bartlett described the process for making steel tubes by means of dies, as practiced in France. An interesting feature is the welding of cold steel; one tube is drawn upon another; so perfect is the welding that there is no way of seeing it, except by using acids.

Mr. Fleury spoke of the importance of coating the face of the rail, used in railroads, with steel, by changing the molecular arrangement of that part of the iron; this adds vastly to its durability.

Mr. Justice of Philadelphia doubted the practicability of this plan, on account of the great difference in the expansibility of iron and steel. The whole variation in temperature, from the coldest point in winter to the hottest in summer, is not far from 120 degrees Fah. Some iron rails have been said not to last over six months, but these were near stations where the trains were stopped many times a day, causing a very great increase of friction, and the rails were more used in the changes of these points. He stated that a plan for "steeling" rails was now being carried out at Pittsburgh, Pa.

After selecting as the subject for the next discussion: "The best means of rapid transit through the City of New York," the Association adjourned.

AMERICAN INSTITUTE POLYTECHNIC ASSOCIATION,
April 7, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

PERCEPTION OF MUSICAL SOUNDS.

Dr. Rowell took the floor for the purpose of illustrating by a few experiments the statement made at the last meeting with regard to the vibrations which produce musical sounds. It was then stated that the perception of sound, communicated through each ear, varied in the same individual; and, further, that the impression of the pitch was not the same in both ears; the last statement, although made on published authority, he denied, and he wished to demonstrate this point. A vibrating body communicates its vibrations to another solid, of more extended surface, which materially increases the force or volume of sound. For instance, the tuning-fork he set into vibration, communicated vibrations to the air in its immediate neighborhood, which could only be heard by placing the fork very near his ear; but when he brought the handle of the vibrating fork in contact with the table before him, the wood also vibrated, and a volume of sound was sent out which could be distincly heard in every part of the room. This illustrates the principle of the sounding-board, which is applied to all stringed instruments. Every sonorous body has a note of particular pitch which it gives when it is struck, and if the same sound is made by a voice, the vibrating air will have the power of imparting its rate of motion to that body. Thus the glass vane he had before him was set into vibration by his voice, and gave forth the sound after his voice was silent. But it responds only to the note it would make on being struck by the finger. These are called sympathetic vibrations. Now the human ear receives all sounds, but the tympanum must report the precise number of vibrations which the air has given; it seems, therefore, apparent that the same person could not regard the same sound as different in pitch when heard first by one ear, and then by the other.

Mr. Garvey said he was not convinced by the argument just made, because sympathetic vibrations were not confined to the number making a single sound; for the octave, third and fifth of that sound were also generated, and in many cases were loud enough to be heard.

A STANDARD DIAPASON.

The Chairman said it might not be out of place to allude to an interesting fact with regard to the diapason. Many people suppose, that as we have an abundance of tuning-forks, we must have a permanent standard of pitch. But the existence of church bells several hundred years old, tuned at first to certain letters, prove by their present sounds that the standard pitch has been raised considerably. Italian concert pitch has always been higher than that in ordinary use. The cause of the gradual ascent of the diapason is, probably, owing to the fact that the violin, the leading instrument, is tuned by fifths; and that in modulation by true fifths, which can only be made by stringed instruments of the violin class, or wind instruments having sliding tubes like the trombone, there is a constant tendency to overlap a true octave. Twelve-fifths measured upward exceeds seven octaves just the musical interval called a comma. The isotonic temperament of all instruments having twelve fixed sounds within the octave, like the flute and piano, require that E and A should be more acute than the true notes of the natural scale distinguished by these two letters. Conversations with the distinguished composer Wallace has confirmed this opinion. The musical world has not yet adopted a standard diapason. France, always foremost in metrical reforms, several years since fixed the pitch of A at 870 vibrations per second, equivalent to 522 vibrations for the middle C. Doubling this number will give the consecutive octaves above, and halving it the octaves below. It will be perceived that fractions must be introduced below 261 vibrations, therefore many scientists, among them Sir John Herschel, have recommended the adoption of the pitch produced by 512 vibrations per second as the middle C. It is the ninth octave of an imaginary sound having one vibration per second. The fourth octave is the lowest which makes such impression on the sense of hearing as to give to the mind a perception of sound.

THE PAIXHAN GUN.

Capt. Maynard desired to correct a statement made at the last meeting, that the Russians inaugurated horizontal shell-firing. The fact is that the system is entirely American. The gun for horizontal shell-firing was invented by Col. Bomford during the administration of Jefferson, which he desired to call the Jeffersoniad, but as the President was not a military man he declined the honor. Gen. Paixhan, a French officer, then in this country, was struck with the experiments of Col. Bomford, and when he returned to France he brought out the system there, and the gun was soon known as the Paixhan. The gun is the same as that in our forts called the Columbiad. Captain, now Major-General Halleck, was his authority for making this statement.

The Chairman presented the following important scientific intelligence :

Changes in Cheese.

M. Blondeau has examined the changes produced in Roquefort cheese when stored away in cellars to acquire the flavor which recommends it to the taste of some people. He found fresh cheese contained

Casein	85.43
Fatty matter	1.85
Lactic acid	.88
Water	11.84
Total	100.00

After being two months in a cellar similar cheese contained

Casein	43.28
Margarin	18.30
Olein	14.00
Butyric acid	.67
Salt	4.45
Water	19.30
Total	100.00

The remarkable change of casein into margarin and olein, the author believes to be due to a mycoderm of the genus Penicillium. The proportions of the last named compound being nearly those found in butter, he concludes that butter is formed in the animal economy at the expense of casein.

Glucose.

M. Cloez has announced before the Paris chemical society a means of separating glucose from the chloride of sodium, by the employment of the acetate of silver. The soda is precipitated with concentrated oxalic acid, and the evaporated solution is extracted with alcohol, which only dissolves glucose.

Organic Acids.

Mr. Cloez has also described a method of analyzing organic acids when combined with potash or soda. The organic matter is mixed with tungsten acid, and burned in a current of pure dry air.

Wolfram or Tungsten.

M. Le Guen states that his experiments prove that wolfram up to 2½ per cent increases the hardness and tenacity of iron. Beyond this proportion it is prejudicial.

Calabar.

Messrs. J. Jobst and O. Hesse, of Stuttgart, have published their researches made to ascertain the active principle of calabar or the ordeal bean, used by the natives of Upper Guinea for testing the guilt of prisoners. They have succeeded in obtaining from the bean very minute quantities of an alkaloid which they call *phytostigmin*, in which the poisonous quality resides. It may be interesting to the medical jurist to know that two drops of this substance introduced into the eye of a rabbit, which was not killed by poison, caused the pupil to contract one-fourth, while the eye of the rabbit poisoned by this alkaloid was not perceptibly affected. The eye of one poisoned by cyanide of potassium is scarcely contracted at all.

New Species of Animals.

Among the thirty-eight species of mammals collected by captain Speke in eastern Africa, is a new antelope, and of sixty-one varieties of birds—five are new.

The Pure Arabian Horse.

Mr. Gifford Palgrave has lately given before the Geographical society of London, an account of his travels in Oman, a kingdom in the southeast corner of Arabia, through which he traveled in the guise of a wandering doctor. He had been absent from England eighteen years. The fame of a cure, by an infinitesimal dose of strychnine, brought him before the king at the Wahabite capital, and he there had two opportunities of examining the royal stud, which consists of the purest breed of the Arabian horse, the celebrated Nujji breed, none of which had ever been or would be sent to Europe. They were never sold by any chance whatever. They could only be got either in war or as a present, or as a heritage from father to son. Whatever we can imagine of perfect beauty in a horse is said to be outdone by them. They are a small breed, rarely exceeding 15 hands high. The prevailing color is gray. Not a single bay could be seen. Chestnut was occasionally seen. Some were mottled, a few were white, but none were perfectly black. The beauty of the race was in the excessive cleanness of the legs, which resembled those of the stag more than the horse, in the extraordinary delicacy of the muscle, the graceful sweep of the haunches, the beautiful set-on of the tail, and in the extreme slope of the shoulder-blade, which gives these horses a pliancy such as he had never seen in any other breed. There were 130 horses in the royal stables

On the Limits of Perpetual Snow.

Mr. E. Renon has announced to the French academy of sciences his discovery of the following law. In all countries in the world the limit of perpetual snow is the height at which the hottest half of the year has a mean temperature equal to that of melting ice. From observations made, the author does not completely verify the law, but he shows there is an agreement as satisfactory as possible in the present state of our knowledge.

Dreaming and Somnambulism.

W. S. Savory, F. R. S., in a lecture on dreaming and somnambulism, in relation to the functions of certain nerve centers, thus summarily contrasts the several states. In profound sleep, there are no acts beyond excito-motor ones, and even these are reduced. In somnambulism, there are, beyond these, sensori-motor acts. In dreaming, ideas are crowded. Dreaming, or a combination, must be distinguished by purely somnambulistic acts. Perhaps in the common form of somnambulism, dreaming is, to a greater or less extent, associated with it. Thus somnambulism is presented under various forms, according to the absolute and relative degree of activity of the different senses, and the condition of the central lobes. All forms occur, from merely turning in bed to walking, talking, writing, &c. And as in somnambulism some degree of activity by the cerebral lobe may be associated with an active state of the sensorium, so in dreaming some degree of activity in the sensorium may be combined with an active state of the cerebral lobes. In the so called state of somnambulism, in which acts are performed which involve a considerable exercise of the mental powers, the simply somnambulistic state must be combined with vivid dreaming. In this combination, so many of the faculties are more or less active, so few, if any, are completely at rest, that the individual is more awake than asleep.

PHOTOLOGICAL.

The distinguished Dr. Draper of the New York University, in a late discourse, thus speaks of the impressions made upon us by light : "If after the eyelids have been closed for sometime, as when we first awake in the morning, we suddenly and steadfastly gaze at a brightly-illuminated object, and then quickly close the lids again, a phantom image is perceived in the infinite darkness before us. We may satisfy ourselves that this is not a fiction of the imagination, but a reality ; for many details that we had not time to identify in the momentary glance, may be contemplated at our leisure in the phantom. We may thus make out the pattern of such an object as a lace curtain hanging in the window, or branches of a tree beyond. By degrees the image becomes less and less distinct ; in a minute or two it has disappeared. It seems to have a tendency to float away in the vacancy before us. If we attempt to follow it by moving the eye-ball, it suddenly vanishes.

"Now the condition that regulates the vanishing phantom of images on the retina is, that when they have declined in vigor to less than 1-64th of the intensity they have while in presence of the object that formed them, they cease to disturb the sight. This principle is illustrated when a candle-flame is held opposite to the sun, or any light having more than sixty-four times its own brilliancy. It then ceases to be visible. The most exact of all known methods for measuring light—that by the extinction of shadows —is an application of the same principle.

"But the great fact that concerns us is this. Such a duration of impressions on the retina of the eye demonstrates that the effect of external influences on nerve vesicles is not necessarily transitory. It may continue for a long time. In this there is a correspondence to the duration, the emergence, the extinction ef impressions on the photographic preparation. Thus I have seen landscapes and architectural views taken in Mexico, developed—as artists say—months subsequently, the images coming out after the long voyage in all their proper forms, and in all their contrast of light and shade. The photograph had forgotten nothing. It had equally preserved the contour of the everlasting mountains and the passing smoke of a bandit fire.

"Are there, then, contained in the brain more permanently, as in the retina, more transiently, the vestiges of impressions that have been gathered by the sensory organs? Do these constitute the basis of memory—the mind contemplating such pictures of past things and events as have been committed to her custody? In her silent galleries are there hung micrographs of the living and the dead, of scenes that we have visited, of incidents in which we have borne a part? Are these abiding impressions mere signal marks, like the letters of a book, which impart ideas to the mind, or are they actual picture-images, inconceivably smaller than those made for us by artists, in which, by the aid of a microscope, we can see, in a space not bigger than a pin-hole, a whole family-group at a glance.

"The phantom images of the retina, as I have remarked, are not perceptible to the light of day. Those that exist in the sensorium in like manner do not attract our attention so long as the sensory organs are in vigorous operation, and occupied in bringing new impressions in. But when these organs become weary and dull, or when we experience hours of great anxiety, or are in twilight reveries, or sleep, the latent apparitions have their vividness increased by the contrast, and obtrude themselves on the mind. For the same reason they occupy us in the delirium of fevers, and doubtless also in the solemn moments of death. During a third part of our lives we are withdrawn from external influences—hearing and sight and the other senses are inactive, but the never-sleeping mind, that pensive, that veiled enchantress in her mysterious retirement, looks over the ambrotypes she has attracted—ambrotypes, for they are unfading impressions—and combining them together as they chance to occur, weaves from them a web of dreams. Nature has thus introduced into our very organization a means of imparting to us suggestions on some of the most profound topics with which we can be concerned. It operates equally on the savage as on the civilized man, furnishing to both conceptions of a world in which all is unsubstantial. It marvelously extracts from the vestiges of the impressions of the past overwhelming proofs of the reality of the future; and, gathering its power from what might seem to be a most unlikely source, it insensibly leads us, no matter who or where we may be, to a profound belief in the immortal and imperishable, from phantoms that have scarcely made their appearance before they are ready to vanish away."

Rapid Transit through New York.

Mr. Fisher opened the discussion on the best mode of rapid transit through the city with a written opinion, of which we can only report the leading points. After examining the question of grades involved in construction of the proposed underground railway, the cost of the work was presented as the most serious impediment to its success. Six millions strikes the imagination and makes six thousand dollars ridiculous. Millions are exciting, and there is a disposition to believe in a scheme so respectable. But the five miles will never be made for six millions of dollars. Even in England, where work of all kinds is much cheaper, tunnels of the coarse kind used on the railways, cost nearly as much. The Box tunnel on the Great Western Railway cost $880,000 per mile ; the Saltwood tunnel on the South-Eastern, $1,038,400 per mile ; the Kilsby tunnel on the London and North-Western, $1,114,000 per mile. When we allow for finished masonry and for the difference of wages and price of materials, two millions of dollars per mile will be the more probable cost of the tunnel under this city.

It will not do to assume that drift gravel is the only ground to be cut through, and it is a well-known fact that tunnels sometimes cost two or three times more than the estimates. As a financial speculation this may do, if all other improvement can be prevented; and the company can pack passengers, as they are now packed in the street cars, and drive them by steam; but if every passenger is to have a seat, and improvements are carried on above ground to draw a portion of the travel to the street railways, this tunnel will not be profitable as a city passenger line.

Twenty miles an hour is the speed proposed. This is too slow for trains; thirty-five miles an hour is wanted. To stop and start trains at that speed will involve the expenditure of great power, the exhaustion of great volumes of steam and gas, and enormous wear and tear. The momentum of a train at thirty miles an hour would lift it thirty and a quarter feet high; add to this the rotary motion of the wheels and axles, and the whole momentum would run the train a mile. Mr. A. T. Smith, superintendent of the Hudson River railway, is of opinion that it costs $1.25 to stop and start one of its passenger trains; and that there is a loss to the company from stopping at several of the lower stations, which loss is borne because people of influence insist on accommodation. The Lowell railway company, with lighter trains and lower speed, computed that ninety cents was the cost of each stop and start. It would seem impracticable and dangerous to allow this road to be used for the heavy trains from the three great railways which enter the city from the north, and to run between these steam cars for carrying city passengers. But it does not appear that either of the companies owning these railways has anything to do with this underground scheme. It may be that the proposed branches to the stations of these railways are to be built by the tunnel company for the purpose of securing the passengers from abroad. The speaker regarded the tunnel plan as the poorest among the improvements proposed for increasing the speed of travel. The other plan, explained before the Polytechnic at a previous meeting, for an elevated railway, passing over the cross-streets at such a hight as not to interfere with travel, he believed would be better. If such great speed is needed on the streets, steam-driven cars on the street rails, or steam carriages on the street pavement, would be better than the underground plan. A dark passage poisoned with carbonic acid and humid with vapor is not fit for civilized men to travel in.

In regard to road surfaces there has not been an improvement since the Roman Empire. The modern innovation, the broken stone system of McAdam and Telford, is in no sense an improvement. It is indeed more pleasant to ride upon than the paved roads of France; but compared with the stone tracks of Lombardy, or the pavement of Naples and Tuscany, it is less pleasant, more difficult of traction, subject to atmospheric influences, and far more expensive. It was stated before a committee of Parliament, by one of Telford's assistants, that within twenty miles of London a paved road would be cheaper than one of broken stones. The cost of repairs of a McAdam road in London was proved greater than that of paving in the proportion of one hundred to twelve. The only advantage of the broken-stone road is that the horse has a better foothold than on the pavements. The horse is the dictator; he must have a road that makes eight times more detritus than a pavement makes, and, taking all weather together, has about double the resistance.

The modern road material, iron, is yet to come into general use. The railway has shown its superiority, and the locomotive has shown that the horse is not a necessity. Cast iron for flat roads is the material that the last eighty years has developed; when we have the independent judgment to use it we shall have better roads than the ancient Romans had.

At the conclusion of Mr. Fisher's remarks, the evening was so far spent that no attempt was made to present the elevated railroad plan.

Dr. Parmelee said the principal objection made to the underground road was the necessity of breathing bad air—this, coming from those who are constantly visiting badly ventilated assembly rooms, and underground restaurants, where thousands take their meals by gaslight, does not have the force of sincerity; but to relieve the fears of these gentlemen he would state that it takes only twenty pounds of caustic lime to absorb thirty pounds of carbonic acid gas.

Mr. Thomas C. Smith remarked, if we are compelled now, sometimes, to breathe bad air in our buildings, it was no reason why we should continue to construct badly ventilated apartments. People generally are averse to riding underground. He well remembered the sensation he experienced while passing through the railroad tunnel under the Jura mountain, which is about three and a half miles long. Those who were with him also complained of the closeness and dampness of the air—the depressing effect was very general.

Mr. Nash expressed his opinion at length against the feasibility of tunnels, and the argument that they were used in Europe would be the last one which would have weight with him. He contended that the light of day was essential to health, and when the effect of these continual dark transits are understood, Americans will refuse to make them.

The subject selected for the next discussion is "The Utilizing of Waste Products." Adjourned.

American Institute Polytechnic Association,
April 14, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey,

A Caloric Engine.

Mr. Roper, of Boston, explained, with the aid of diagrams, a caloric engine now in operation at the Sanitary Fair, designed to be used where small power is required. Its peculiarity is that it does not use upon the piston common air heated, but only the products of combustion. The air to supply oxygen for the combustion of anthracite coal is pumped in; the carbon is burned rapidly and completely, under pressure, and the resulting carbonic acid gas and uncombined nitrogen gas from the air are passed from the generator to the piston, which is in the form of a hollow plunger, so arranged that it is packed and fitted only at the top, where there is the least heat. In this way, the common difficulty of lubricating a hot cylinder and piston is obviated. The generator of heat is surrounded with fire-brick or soap-stone, which prevents the iron from being burnt. The engine is single-acting—that is, the power is applied to the piston moving in one direction, during which movement the air to feed the fire is pumped in; the momentum acquired at the same time by a balance or fly-wheel, is used to carry the piston back to its original position. The diameter of the air-pump in the engine at the Fair is twelve inches; that of its piston is sixteen inches; the difference of the areas in the pump and piston, mutiplied by the usual pressure, eight pounds per square inch, shows that this engine exerts a two-horse power. It requires about ten pounds of coal per hour. It occupies five square feet of room, and weighs 3,000 pounds.

Mr. Bartlett thought this plan for using the products of combustion, one justly deserving our careful consideration.

The Chairman said an engine was invented by Blanchard which used both steam and the products of combustion. A steamer was built on this plan, and run for some time in New York harbor. A committee from this Institute examined it, and reported a saving of fuel by the arrangement. But when the steamer was put on a regular route, it was found she was not always to be relied upon. The combustion in this plan was carried on under pressure; the steam was used on one side of a piston and the gaseous products of combustion on the other. There was danger in that arrangement that the cylinder would be marred by the solid particles in the products, but in the plan before us this defect is remedied. Many persons have been deceived by sanguine statements regarding air or caloric engines. It is not claimed for this plan, as has been for nearly all others of this class, that it is a great saver of fuel. In fact, it takes a little more than the best steam engines; but it is safe, convenient, and will not burn out so rapidly as those having the iron cylinders in direct contact with the fire.

Dumping Wagon.

Mr. Davis exhibited a model of a new dumping wagon, which could also be used for the ordinary work of a farm. It is a Vermont invention. The wagon is divided into several compartments, and the load in each is balanced so as to be readily discharged.

Mr. A. L. Fleury addressed the Association on the separation of gold from quartz and other ores.

After alluding to the ordinary process of extracting gold by means of mercury, which forms an amalgam easily separated by heat, the speaker said the general opinion has been that as gold is nineteen times heavier than water, all the particles would sink in this liquid. Prof. Faraday has shown that when chloride of gold in solution was placed in a bottle, and gradually small portions of phosphorus were added, the gold, instead of sinking to the bottom, remained suspended in the liquid, giving to it a fine red color. Does this curious fact—explaining to us the deplorable loss of at least fifty per cent of gold in the ordinary washing process—not indicate the existence of some fixed law by which heavy bodies may be so finely divided that they may remain suspended between the atoms or molecules of liquids or gases?

Several processes for extracting gold were adverted to, and facts presented which the speaker was not aware had been fully discussed at previous meetings of the Association.

It was stated, in reply, that the late Prof. Renwick had explained how gold eluded the grasp of the washer when in the form of a sulphuret, and why the tailings, after being exposed to the air for several years, would yield gold on a second washing.

Prof. Everett said the process for dissolving gold quartz by means of hydrofluoric acid was not economical, on account of the cost of making the decomposition of fluor-spar.

COLOR-BLINDNESS.

Dr. Rowell had placed on the wall some blue-colored cards, having upon each one large and one small red spot; he wished to show how much the power to distinguish colors varied in a mixed audience. It will be found that the small spot will appear blue when the spectator has removed a certain distance. This distance is different for nearly every spectator.

Mr. John E. Gavit said this experiment did not illustrate what is commonly known as color-blindness, for the person thus defective cannot distinguish certain colors when they are placed quite near the eyes. Distance has nothing to do with color-blindness. Since different colored lights have been used as signals on railroads and in light-houses on the sea coast, the subject has assumed great importance. He remembered that in crossing the Atlantic in 1846, this subject was the topic of conversation as the ship came in sight of a certain light which was known to be red, yet to no two persons did this light appear to be of the same color. The number of persons deficient in the power to distinguish all the colors is much larger than is generally supposed. At his request Mr. Garvey, the Secretary, read the following extract on this subject from *The Popular Science Review:* "From the calculations of various authors that one person out of every fifteen is color-blind, and from the investigations of the late Dr. Wilson upon 1,154 persons at Edinburgh, made in 1852–3, we gather that 1 in 55 confounded red with green, 1 in 60 confounded brown with green, 1 in 46 confounded blue with green; hence that 1 in every 18 had this imperfection. Professor Siebeck found 5 out of 40 youths in the upper class in a school at Berlin color-blind. Professor Provost thinks it occurs on an average in 1 in 20 persons; and Wartmann, whose investigations almost exhaust the subject, thinks this estimate is not exaggerated. M. Lubeck rejects this conclusion as unsound, from the observations being made in England and Germany, where blue is the prevailing color of the eyes; and it is a question with him whether it occurs so frequently in persons the *irides*-color of whose eyes is black or hazel. In answer to this it seems the great majority of cases examined by Wartmann had black irides."

Mr. G. Bartlett said the terrible railroad accident at Norwalk, Conn., several years since, was caused by the engineer's mistake in the signal that the draw of the bridge was open. A gentleman who had this defect in sight suspected the cause, and on examining the engineer on his sick bed found that he could not distinguish all colors, but the engineer was not aware until then of this deficiency.

Prof. Vanderweyde said there were a few painters of quite a reputation in this city who have some small degree of color-blindness, and mix false colors in their landscapes. We notice the same defects in distinguishing pitch as in color. Having had great practice in teaching music, he found that about one in twelve could not distinguish the proper scale. When he came to a certain note of the octave he always confounded it with another.

Mr. T. D. Stetson said after the Norwalk accident he was employed to investigate the cause. He took a locomotive and went over that part of the route, and with regard to the signal he observed it was not high enough to bring the sky as background, but the woods behind the signal tended to deceive the eye. He had observed that there were different degrees in this power of distinguishing color. He had once in his employ a person who could not distinguish a green from a yellow line. He himself could not see differences in color as well as another gentleman in his office. He therefore concluded that the power to distinguish tints was not precisely the same in any two persons, although there would be a very general agreement as to a color.

Residual Magnetism.

Dr. A. Von Waltenhofen asserts that the amount of magnetism remaining in the soft iron of an electro-magnet, after the cessation of the electric current, is dependent on the manner in which the current is interrupted. The amount is greatest after a gradual interception. The residual magnetism is very soft iron is often of an opposite nature to that previously existing, after the very sudden interruption of a strong current. This seems to him to furnish strong proof that magnetism is not caused by the separation of two fluids, but by the motion of magnetic molecules, to which is opposed a certain amount of frictional resistance. He compares each magnetic molecule to a spring which is bent back. If suddenly released it will return to its original position, or go beyond it; but if gradually released it will not go quite to its primitive place.

The Chairman added—The power to retain magnetism in soft iron increases in greater ratio than the mass. For this reason persons who had made small working models of electrical machines were often disappointed on finding that similar machines, made on a large scale, did not exert increased power in proportion to the increased size.

The Chairman then presented the following interesting compendium of recent scientific experiments and discoveries:

Steel Boilers.

Important experiments have been made in Prussia with steel boilers. Two boilers, each 30 feet long and four feet in diameter, without flues, were placed side by side. One was made of steel plates, one-fourth of an inch thick, the other of iron plates 0.414 of an inch in thickness. The steel boiler was tested by hydraulic pressure up to 195 pounds per square inch. Both boilers were worked for about a year and a half under 65 pounds pressure. At the end of that time there was less scale in the steel than in the iron boiler. The steel boiler generated 25 per cent. more steam and evaporated an average of 11.66 cubic feet of water per hour; the iron evaporated 9.37 cubic feet. The quantity of coal consumed per 12 hours was 2,706 for the steel, and 2,972 for the iron boiler. The plates of the steel boiler directly over the fire were found to be uninjured, while those of the other were worn out. The advantages of the steel boiler are strength, lightness, rapidity of evaporation, durability under heat, the securing of more perfect riveting, and comparative freedom from scale.

THE PRODUCTION OF OXYGEN WITHOUT HEAT.

Mr. J. Robbins has explained before the London Chemical Society the process used by him for obtaining pure oxygen. The combinations made by him are not original, yet they may not be generally known among those who separate and use this gas. The compound used is the peroxide of barium and bichromate of potash. It is placed in a glass flask or bottle provided with an exit tube, and a mixture of dilute sulphuric and hydrochloric acids is poured on, when the oxygen is rapidly evolved. Peroxides of potassium, sodium, strontium, and calcium, may be severally substituted for the peroxide of barium. And manganate or permanganate of potash, binoxide of manganese, and binoxide of lead, may be used in the place of bichromate of potash; but the cost of these articles renders the latter most available. The chemical changes in this process not readily explained are the formation of the sulphate of baryta and peroxide of hydrogen, or oxygenated water; this, in contact with chromic acid, is reduced to water, and the sesquioxide of chromium is formed; oxygen gas being disengaged from both substances, quite pure, and fit to be used for medical purposes.

INK-PLANT.

Prof. Jameson, of the University of Quito, states that the expressed juice of the berries of the *coriaria thymifolia* is used by him in preference to the ordinary ink, because it does not corrode the steel pen. There is a tradition that during the Spanish administration documents written with this juice and the common ink, were sent to the mother country. During the voyage around Cape Horn the documents got wet; those written with ordinary ink became nearly illegible, while those written with the vegetable juice remained unaltered. A decree was afterward issued that all Government documents should be written with Chauchi, the name of the juice.

THE ELECTRIC FLY.

Mr. Charles Tomlinson communicates to the *Philosophical Journal* an interesting account of many experiments made by him with the little instrument used in connection with an electrical machine called the electric fly or mill, or *tourniquet*, which is formed of two or more metallic radical arms, having their extremities bent at right angles and brought to a fine point. As a preliminary explanation why he has made these experiments, he gives various opinions of philosophers as to the cause of its action. After detailing its backward revolutions in the open air and under a glass vase, its inaction in rarefied air, its increased action in turpentine, benzole and paraffine oils in both directions, and its forward motion in the air after a modification of its points, he concludes, while inclining to the opinion of Cavello, as a general explanation, "that the theory of the fly requires a different expression for an aerial as compared with a liquid dielectic, its behavior is also different in air of different densities; and also when wholly and partially inclosed; also, when the points are covered; and even then there is a difference in action, in the presence of flame," from which we infer that its behavior is so modified by circumstances that no one expression represents the law governing its action.

The Chairman remarked that he had witnessed lately experiments similar to some of those described by Tomlinson, of which more would be said hereafter. The electric disturbance is very beautifully illustrated by the down of the milkweed. If the hand be held at the distance of three feet from the conductor, while the electric machine is in motion, the down darts rapidly between the two. It does not always move in a right line, but approaches the fingers in a curvilinear direction, thus showing the portions of the intermediate air affected.

Magnesium Light.

Prof. Roscoe states that the burning of a magnesium wire, having a thickness of 0.297 of a millimeter, evolves a light equal to that of seventy-four stearin candles of six to the pound. If this light lasted one minute, 0.987 of a meter of wire, weighing 0.1204 grm. would be burned. In order to produce a light equal to seventy-four candles for ten hours, where about twenty pounds of stearin is consumed, 72.2 grms. of magnesium would be required. This light has been used in England for photographic purposes.

The Spectrum of Carbon.

Coal, charcoal and the diamond cannot be vaporised by heat when isolated, yet M. Morrin, of Versailles, finding the same spectrum produced by the common gas flame, cyanogen, carbonic oxide, carbonic acid, ascetylene, and the hydro-carbons generally, he concludes this result must be due to the only element common to all these compounds, carbon, and in a state of vapor It follows that the theory of the candle flame must be somewhat modified. The base of the flame being blue, is the vapor of carbon preserved from combustion, but kept at a very high temperature by the envelope of hydrogen, the more combustible element of the gaseous carbides from the decomposition of wax, the hydrogen alone uniting with the oxygen of the air. Above the blue part comes the luminous part produced by the passage of the carbon from the gaseous to the solid state, giving out in the passage a considerable amount of heat. The black cone surrounding the wick of the candle is formed of gaseous carburets of hydrogen, which only burn in the upper part of the flame, where they come in contact with oxygen. Hydrogen not being very combustible but very subtle, diffusive and penetrating, its combustion takes place under conditions in which it would be impossible for other gaseous bodies or vapors to burn. If a candle be gently moved so that the flame may be inclined and the air allowed to come in contact with the vapor of the hydro-carbons which surround the wick, we see the hydrogen take fire, and above the flame appears the blue vapor of the carbon. The latter can only exist alone, and gives its numerous reactions when it has near it the high temperature produced by the combustion of hydrogen. When cyanogen is burnt in a current of oxygen, the high temperature produced by the interior of the flame, makes the vapor of carbon intensely hot, and hence very luminous, consequently its spectrum is very luminous.

The following communication was received from a prominent member of the American Institute, James Bogardus :

To the Secretary of the Polytechnic Association of the American Institute :

Sir—On page 392 of the volume of the Transactions of the American Institute for the year 1862, I find the following :

"Dry Gas Meters."

"Mr. John Johnson : The dry meter on the table I placed there for the inspection of members. In connection with the subject I will state that the first dry meter in America, was made at the suggestion of Wm. S. Johnson, by James Bogardus, in 1832, and there has been on an average a patent a year since."

Standing alone, without further comment, without apparent notice by the Association, this paragraph would not have attracted my attention, had it not been pointed out to me by several of my friends who were aware that my name should never have been mentioned in connection with that of the person referred to as suggesting the dry gas meter. The necessity of a contradiction of the statement of Mr. Johnson has been urged upon me, and though painful to me to recur to the subject, I am convinced that the printed record of what he said uncontradicted, ought not to stand unnoticed.

I propose, in few words to give the outlines of the history of the dry gas meter. It was invented and made by me, without suggestions from anybody. I utterly and entirely deny having received a suggestion of either subject or mode, from any person, at any time ; and characterize the whole paragraph quoted above as false in letter and spirit.

In the year 1831, I made the first experiments towards the dry gas meter. As I proceeded in my investigations, I found that the chief difficulties could be overcome, by making the meter in two equal parts divided in the middle, with a moveable partition placed between them. After repeated experiments I finally brought the meter into a compact form, and had it patented and sworn to as my invention, the late Mr. Serrell drawing the specifications therefor.

The history of this, and subsequent patents, is curious perhaps ; certainly of painful interest to me. In the year 1833, I commissioned a young man then going to England, to take out an English patent for me. On his arrival, he discovered that Messrs. Newton & Berry, of Chancery Lane, were then obtaining a patent for this same meter—my meter, and for which, Mr. Johnson had engaged Mr. Olmstead of New York, who had applied for the patent, through Mr. Timothy Wiggins of London. Mr. Wiggins there employed Messrs. Newton & Berry as his agents. The gentleman whom I had employed, died shortly after his arrival in London, and before he had been able to intercept the movements of Messrs. Newton & Berry. There could be no doubt of the identity of this meter. It was exactly the same one I had patented here, the same model, the same defects of construction, all of which I had not yet overcome.

I had here exhibited at the Fair of the American Institute in 1834, this meter; and had received the highest premium therefor. Afterwards, not being satisfied with it (because the light flickered after the gas had passed through the meter), I further improved it, and corrected the imperfection, by the introduction of a rotary motion by means of two or more movable partitions, which I called diaphragms. With this improved meter, I started for London in 1836, in company with a supposed friend, who had engaged to take out the patent for me, and in my name. The patent was taken out not in my name, but my agent took it for himself, coolly informing me "that the patent was his, that I had no more right to it than any other individual."

On making inquiries there, I ascertained that the first patent had been sold by Messrs. Newton & Berry to a Mr. Thomas Edge, of No. 6 Poultry Cheapside, for three thousand pounds, who had again sold it to the London Gas Meter Company (which had been formed by him), for twelve thousand pounds. After the second patent had been granted, I saw Mr. Edge, who informed me that the Company had decided to give the same amount for *this*, as for the first one, namely, twelve thousand pounds. What it really brought I never knew, although I was told that the patentee valued the invention at 100,000 pounds.

My American patents had no better fate, at least brought no better returns to me. My long absence may, perhaps, in part account for the manner in which my invention was appropriated by others; I only know that my five years' labor and perfected invention never brought me a farthing in return. Some changes have been made from time to time since then; but the latest improvement was getting the meter back into exactly the same shape in which it left my hands.

I received a notice, cut from a London paper, in which was reported the charge of an English judge to the jury upon a dry gas meter patent case, who said, "All changes undertaken to improve the meter, have not improved it, and therefore, Bogardus is the inventor of the Dry Gas Meter." Mr. Leonard, late secretary of the American Institute, received a similar notice. Thus has my long labor been lost; and what has proved a valuable invention, passed into other hands. It is not a consoling reflection, that while I have never been able to obtain the smallest remuneration for my labor and service to the public in this matter, neither have the public enjoyed the free use of my invention. It is not with any pleasure that I recur to this subject,—but I have a right to claim that the Institute which has in times past honored me by its notice and rewards, should not now allow, a falsehood, damaging to me, to remain uncontradicted in its records.

In the year 1831, I invented and made an engraving machine, (this is the machine that cut the die for the gold medal of the American Institute) I hired a room over Seymour's hardware store in Chatham Square, and partitioned off a small part for a private room, in which this machine was kept.—Some time in 1832 Mr. William S. Johnson brought his son John, who was bound apprentice to me and worked in the outer room, I always kept the key of the private room, and allowed no one to enter but myself. In 1833 I dismissed John, and gave up his indentures to him. Father and son soon afterwards went to England, and I heard but little of them, until after my arrival there in 1836. On going into a machine shop in London, I saw hanging on the wall, an extract drawing of my engraving machine, and was told that it belonged to a man name Johnson from New York, who had received orders to build the machine, but had failed to make it work. It was then that I learned that the gas meter had been sold to Mr. Thomas Edge of Poultry, Cheapside for £3,000—I also found that he had patented my eccentric mill, and sold it to Sharp, Roberts, & Co., of Manchester for £2,000. He also, sold, another important invention of mine, called the ring spinner, for which I had a patent here, I could not ascertain what he got for it. After my return home, I met the very man who had made the drawings of the engraving machine.

Respectfully Yours,
JAMES BOGARDUS.

The regular subject of the evening was taken up and examined as follows:

Utilization of Waste Products.

Dr. D. D. Parmelee opened the discussion by remarking that if the subject included the employment of spent products in an illegitimate way for adulteration, as well as the reworking and useful application of refuse articles, a wide field would be opened, but not the less interesting for its extension, for it would embrace that class of facts which lead us to attend to a personal examination of our diet, clothing, and the various articles of domestic consumption and use. As an illustration of the perversion of spent products, he alluded to the statement of Dr. Mahew of London. From trustworthy data, he estimates that about 78,000 pounds of exhausted leaves are dried and mixed with cheap tea, and sold to the poorer classes as a genuine article. Beet and turnip leaves are also largely used for adulteration in the manufacture of cigars.

However, of the other class, he stated that the waste made by the sawyer and turner of wood had several economies. Mahogany dust is valuable for smoking fish; box dust for cleaning jewelry; the shavings of cedar for extracting its aroma, 100 pounds producing 28 ounces of the essence. The sawdust of mahogany, birch and rosewood, is used by furriers in cleaning and dressing furs. Spent tanbark from tanneries, pressed and dried, has been used for fuel in making steam. A compound consisting of 27.5 parts of refuse tanbark, 52.5 parts of nitrate of soda, and 20 parts of sulphur has been used as a powder for blasting. It may be interesting to know that there are woolen rags not good enough to be used as "shoddy;" these are found to make a very efficient manure. Many other waste products have the same useful application by cultivation. The speaker then gave a minute description of how every part of the dead horse is used in the arts. Ice, once regarded as a waste product of nature, has become a great article of commerce. The amount annually used in ten cities of our union is 745,000 tons. As an illustration of what may be saved by sweepings, a

New York correspondent of *The London Technologist* stated some time ago that the foreman of the bindery department of the Harper Brothers, came in one morning with a bar of gold, valued at $307.50, which was the proceeds of the gold leaf and dust swept from the floor and wiped from the rags used by the binders during only three months. He further stated that the gold sweepings were worth $1,500 a year, the shavings from paper $5,000, shavings from pasteboard $700, and the scraps of leather $150—making an annual aggregate of $7,850. The latest successful utilization of waste product that had come under his notice was the application made by Prof. Everett, of scrap tin plate in the reduction of sulphuretted lead ore. The theory of the reduction of sulphuretted lead ore by iron, is based upon the fact of the great affinity of iron at a high heat for sulphur. The metallic lead is set free by the sulphur leaving the ore and uniting with the iron, forming the sulphide of iron. By the use of scrap tin plate the iron process is carried to its highest state of perfection, because the tinned iron plate is made of the very best wrought iron. Furthermore, a saving is made of all the tin upon the scraps, which, for many purposes, improves the quality of the lead, but it is easily separated if desired. Tin always commands a far higher price than lead. Another advantage arises from the thinness of these scraps, they present so much surface that part of the iron is oxydized, and makes an excellent flux, thus saving the addition of an artificial flux and reducing the time required for smelting very materially. The waste product used in this process has, until now, been thrown away. In this instance the waste is more valuable than the new material.

At the conclusion of Dr. Parmelee's remarks, it was resolved to continue the discussion of the same question at the next meeting. Adjourned.

American Institute Polytechnic Association,
April 21, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

A New Pontoon Bridge.

During the time devoted to the examination of new inventions and discoveries, Mr. Blanchard illustrated upon the blackboard his plan for a pontoon bridge, which consists essentially in an arrangement of cylindrical floats made of pine wood, in compartments, and to extend, when joined, from 20 to 25 feet; they are furnished with rope handles so that they can be carried by soldiers. The floats are connected by planks crossing each other at their centers, each two moving on the same iron pin; each end of the plank has a similar connection with the floats by means of pins. The planks are counter-braced by ropes passing through floats; by pulling on these ropes the floats are thrown forward in a right line until they reach the opposite bank of the river. The principle applied is that of the lazy-tongs, by which the combined motion of a set of levers is made to increase the motion of the last of the series. Thus a bridge may be thrown across a river with great rapidity. Often it is necessary to place these bridges under the enemy's fire when celerity only can insure success. The speaker invited criticism, for he had only made a small model, which works well, but there may be some serious objection to its operation on a large scale.

Mr. S. H. Maynard expressed a doubt as to the ability to throw this bridge across a stream having a strong current. All the pontoons he had seen required to be anchored.

Mr. Bartlett thought it would not be necessary to anchor more than one in five of the floats. If they were made in cylindrical form, as proposed, there would be danger of rolling. The contrivance appeared to be worthy a trial.

THE WEATHER.

The Chairman introduced to the audience Mr. D. Dick, the inventor of the well known anti-friction press, who entertained them for a half hour with his views regarding the periods of return of similar weather. He had been a careful observer since the year 1813; that season the crops failed, and the timothy run out from the excessive moisture and wild grass took its place. He was then a young lad. The disaster made a strong impression upon him, and he determined to make accurate observations, to ascertain whether there was a regular return of the extremes of heat and cold, of dryness and moisture. After long investigation he had proposed a theory, founded on the evolutions of the moon, comprised within the cycle of the nodes, or a period of 18 years and 228 days. In illustration of this theory, he compared the dry weather of the latter half of August and the first half of September, 1825, with the month of April, 1844, commencing on the second day. A period of 3 cycles, equal to 55 years and 10½ months, was then presented; the very cold weather of 1779-80, was compared with the cold weather of 1835-6—the winter of the great fire in the city of New York.

He next compared the very mild winter of 1827-8, with the summer of 1846—one cycle—the heat and moisture of which summer caused many apple trees to blossom three times, the same tree having on it fruit of three different ages. The next illustration embraced three cycles from the warm summer of 1798 to that of 1854. He closed with the prediction that the winter of 1864-5, will be severe, but the months of March, April and May, will be warm and moist; consequently there will be an early spring. The winter of 1865-6, will be severe with much snow, and especially a very deep snow about the first of March, 1866, being the return of the snow storm of 18th to 21st of February, 1717, old style. It should be understood that when protracted warm weather or drought occurs, its returning cycle may be in the winter, which will be intensely cold, without much snow; but should the summer be warm and moist, the corresponding weather of the succeeding cycle will be warm and moist, even if occurring in the winter.

Mr. T. C. Smith directed attention to the fact that our seasons were becoming later. Mr. W. Sewell said he well remembered the winter of 1835-6; the temperature was 30° below zero. Mr. Stetson inquired whether the observations detailed by Mr. Dick applied to any large portion of the globe; that is, whether the same kind of weather would prevail at the extreme north and south. Mr. Dick replied that the weather might be excessively wet at the south and dry at the north, but whatever weather occurred in a given locality, a cycle would bring there corresponding weather.

The secretary, Mr. Garvey, replied at length to Mr. Dick. We should be careful how we attempt to establish laws upon a few coincidences. He denied that the moon had influence, except upon the tides. There were, however, many causes modifying the weather, which it seemed would almost render nugatory the effects imagined by Mr. Dick.

The Chairman remarked that this subject of periodicity in weather was exciting the attention of prominent meteorologists. Sir John Herschel has requested that daily observations in all parts of Great Britain during 1864, be sent to him, from which he will doubtless draw deductions that may influence the common faith in weather signs. We will put on record the prognostications of Mr. Dick, without endorsing his views upon a subject which always bears with it a charm for all classes of people.

The following notes of scientific progress were then read by the Chairman:

ON BOILING WATER.

Mr. W. Grove, F. R. S., in a lecture before the Royal Institution, presented some facts upon a subject lately brought to the notice of this Association. He first alluded to the statements of Donny before the Brussels Royal Academy, in 1843, that in proportion as water is deprived of its air the character of its ebullition changes, becoming more and more abrupt, and boiling like sulphuric acid with *soubresaut*, and between each burst of vapor, the water reaches a temperature above its boiling point. To effect this, it is necessary that the water be boiled in a tube with a narrow orifice through which the vapor issues; if it be boiled in an open vessel, it continually reabsorbs the air and boils in the ordinary way. Mr. Grove found that with the oxy-hydrogen gas, given off from ignited platinum plunged in water, there was always a greater or less quantity of nitrogen mixed, which led him to examine more carefully the phenomenon of boiling. He arranged two copper wires parallel to each other, in a Florence flask, so as nearly to touch the bottom; the lower ends were united by a platinum wire, about an inch and a half long, which was curved horizontally. Distilled water, which had been boiled and cooled in an air-pump vacuum, was poured into this flask, so as to fill about one-fourth of its capacity. The whole was placed under the air-pump receiver, and a connection was made with the wires of a voltaic battery. In this manner the platinum wire was heated and the boiling continued indefinitely. The effect was curious; the water did not boil in the ordinary way, but at regular intervals bursts of vapor took place, after which the water was perfectly tranquil.

Another experiment with a glass tube five feet long and four-tenths of an inch internal diameter, bent into a V shape; into one end a loop of platinum wire was sealed with great care. Into this tube, water, purged of air, was poured to the depth of eight inches, and the rest of the tube filled with olive oil. This experiment of boiling presented nearly the same peculiarities already mentioned. It was continued for many hours, and even days. It was found that at each burst of vapor a minute bubble of gas passed up through the oil which was not condensed; this was proved to be nitrogen. To avoid any suspicion about boiling by electrical means, similar experiments were made with similar results, in which the boiling was produced by a spirit lamp. He was led to try the effect of boiling an elementary liquid and bromine occurred as the most promising one to work upon. The temperature of the bromine was first raised, until its vapor had driven all the air from the glass tube, when it was sealed by the blowpipe. The bromine vapor, on condensing, left a vacuum above it. After boiling, a notable quantity of a permanent gas was found to have collected in the tube which proved to be pure oxygen. The experiment was repeated with chloride of iodine with the same result, only the quantity of oxygen was greater. Mr. Grove also described his fruitless attempts to obtain in this way the vapors of phosphorus and sulphur. He barely alluded to results on the compound liquids, such as oils and the hydro-carbons, as the fact that permanent gas is given off in boiling such liquids would not be unexpected; but the other experiments seem to show that boiling is by no means necessarily the phenomenon that has generally been supposed, viz.: a separation of the cohesion in the molecules of a liquid from distension by heat.

He believes, from the investigation he has made, that (except with metals on which there is no evidence) no one has seen the phenomenon of pure boiling water without permanent gas being freed, and that what is ordinarily termed boiling arises from the extracting of a bubble of permanent gas, either by the chemical decomposition of the liquid, or by the separation of some gas, associated in minute quantity with the liquid, and from which human means have hitherto failed to purge it: this bubble once extracted, the vapor of the liquid expands it, or to use the appropriate phrase of Mr. Donny, the liquid evaporates against the surface of the gas.

Mr. Grove's experiments are in a certain sense the complement of those of Mr. Donny. The latter showed that the temperature of the boiling point was raised in the same proportion as water was deprived of air, and that under such circumstances the boiling took place by *soubresaut.* The former has shown that when the vapor liberated by boiling is allowed to condense, it does not altogether collapse into a liquid, but leaves a residual bubble of permanent gas, and that at a certain point this evolution becomes uniform. Boiling, then, is not the result of merely raising a liquid to a given temperature; it is something much more complex. Enough had been shown by his experiments to lead to the conclusion that hitherto simple boiling, in the sense of a liquid being expanded by heat into a vapor without being decomposed or having a permanent gas eliminated from it, is a thing unknown. Whether such boiling *can* take place may be regarded as an open question. He was inclined to think it cannot; that if water, for instance, be absolutely deprived of its nitrogen, it would not boil until some portion was decomposed; that the physical severance of the molecules by heat is also a chemical severance. The constant appearance of nitrogen in water, when boiled off, out of contact with the air, almost to the last drop, is a matter well worthy of investigation. He would not speculate on what possible chemical connection there may be between air and water. The preponderance of these two substances on the surface of our planet, and the probability that nitrogen is not the inert diluent in respiration that is generally supposed, might give rise to not irrational conjectures on some unknown bond between air and water. But it would be rash to announce any theory on such a subject; better to test any guess one may make by experiment, than to mislead by theory without sufficient data, or to lessen the value of facts by connecting them with erroneous hypotheses.

PETROLEUM.

At a meeting in London of gentlemen interested in the petroleum trade, held on the 29th of March, the following resolutions, among others, were passed :

That the lowest point of ignition of refined oil be 100° Fahrenheit.

That the gravity of good merchantable refined Pennsylvania petroleum is not to exceed 812 at a temperature of 60° Fah., and that the gravity of good merchantable crude Pennsylvania petroleum is not to exceed .820 at the same temperature.

The specific gravity .812 mentioned in the above resolution corresponds with 43 on the scale of Baume, that of .820 with 41.

SOLAR SPOTS.

Sir John Herschel in an article in *The Quarterly Journal of Science* throws out the suggestion, whether the original exciting cause of solar spots may not be found in the circulation of an elliptic ring of planetary matter, in a state of division sufficiently minute to elude telescopic vision, having a major axis such as would correspond to an average period of 11 1-9 years, and an eccentricity such as would bring its perihelion within the region in question ; the matter of the ring being unequally distributed over its circuit with a minimum and a maximum following in, by an interval, somewhat less than its semi-circumference. By assuming certain conditions as to the constitution of such a ring, and the extent of deviation from an exact quantity in the periodic times of its component elements, he finds that not only the shorter period of 11 1-9 years in the recurrence of spots first determined, but also the longer one of 56 years insisted upon by Dr. Wolf and various other changes are susceptible of explanation.

THE GLACIAL EPOCH.

Dr. Frankland recently delivered a lecture before the Royal Institution, of which the following are the leading points :

1. The effects of the glacial epoch were felt over the entire globe. 2. This epoch occurred at a geologically recent period. 3. It was preceded by a period of indefinite duration, in which glacial action was either altogether wanting, or was at least comparatively insignificant. 4. During its continuance atmospheric precipitation was much greater, and the height of the snow-line considerably less than at present. It was followed by a period extending to the present time, when glacial action became again insignificant. The sole cause of the phenomena of the glacial epoch was the higher temperature of the ocean. Nature's apparatus for producing

ice on a grand scale is an evaporator, the ocean; a condenser, the air; and a receiver, the mountains, which were probably one-fourth higher than now. The evaporation from the ocean being enormous, there was a constant precipitation of condensed vapor on the mountains, where it froze and accumulated; in the form of ice it crept down the mountain and overspread the whole land; and the overwhelming masses of ice left their traces on the rock, along the sides of valleys, and transported huge boulders from far-distant regions. As the earth cooled the evaporation from the sea diminished; snow and ice disappeared, and the present state of things prevailed. But the cooling of the earth's crust still goes on, and must, until it is filled with rents and cracks. The effect being the same which has already taken place on the moon, the moon thus becomes to us a prophetic picture of the ultimate fate which awaits our earth.

The selected subject was then taken up.

THE UTILIZATION OF WASTE PRODUCTS.

The discussion of this fruitful theme was opened by Mr. T. D. Stetson who directed attention to the importance of utilizing blood. While in Chicago, several years ago, he noticed the blood of the immense number of hogs slaughtered there was thrown into the river, and even in the winter the foul odor arising therefrom was a source of considerable annoyance. There were many uses to which this blood could have been applied. A million of hogs are killed annually in that city, and one cent saved on each would amount to $10,000.

Dr. D. D. Parmelee briefly enumerated the most important applications of blood in the arts. The class of waste products which are remanufactured so as to be as "good as new" were alluded to. Prominent among them were "hooped skirts" and "felt hats." The speaker concluded with a description of some of the uses made of

THE WASTE OF COAL OIL AND PETROLEUM.

The introduction of this topic brought to the floor Mr. Lewis B. Page, who said in the first efforts at distilling coal there were many products resulting therefrom for which no use could be found. The odor was objectionable, and as the oil was an entirely new compound not mentioned in the books the chemists knew little about it. But experiment has been crowned with success. The oil is now white and nearly odorless. The products at first thrown away are now used, and may be considered indispensable in some branches of the arts. Paraffine oil, one of the products of coal, when mixed with lard oil makes a lubricator for machinery, said to be superior to sperm, as it does not oxydize or "gum up." Paraffine is made into candles and is a substitute for beeswax; it is also mixed with the latter substance to form salves. Below paraffine is a pitch which is used in making a valuable black varnish; and still below this is a cake which makes good fuel. All the products of coal oil, above parraffine in specific gravity, are used as illuminators; the amount of naptha is not large, and is generally mixed with the heavier products forming the oil. It may be added, that the beautiful aniline dyes, obtained from the coal tar residuum found in gas manufactories, may also be abstracted in small quantities from coal oil waste, but it is not an economical source.

With regard to crude rock oil or petroleum, it may now be said that its products have useful applications. The lighter compounds, varying from 58 to 63 (Baumé's scale), are known as naptha, and form a perfect substitute for turpentine. It is used as high as 65 in making the illuminating substance known as "burning fluid." The still lighter product, ranging from 65 to 75 Baumé, is called benzine, and is a substitute for camphene; it is also used for cleaning wool and woolen cloth, and for dissolving india-rubber. The product of petroleum ranging from 58 to 43, is used as an illuminating oil. The crude product below 43 and above 30 is known as paraffine oil, and used for lubrication, also, when mixed with linseed oil, for painting. It is also found to be very valuable to the currier in finishing leather. Below 30 the product is designated a residuum, and is used for making gas. The St. Nicholas Hotel, in the city of New York, is lighted by it, which effects a saving of about $10,000 per annum, as compared with the cost of lighting that establishment with ordinary coal gas.

In refining crude petroleum, a large quantity of sulphuric acid is used. After it had been employed in the treatment of petroleum, it was formerly looked upon as refuse, but now it is readily sold to the manufacturers of superphosphate of lime, to be used in the dissolving of bones.

Dr. J. B. Rich remarked, that, in examining the different instruments and methods for testing the explosibility of the oils described by the last speaker, a report of which was presented last year to this association, he found that vapor would pass off from them at all temperatures down to 40° Fah., and that the amount of vapor depended on the quantity of the oil under test.

Mr. B. Garvey said, in his experiments with oils, he found that if they were exposed to the air for some time, the lighter particles of the oil would evaporate, and a lubricating oil be left.

Mr. Overton alluded to a fatal accident resulting from the use of petroleum.

Mr. Page replied that the material so used must have been a mixture of light and heavy products. There would be no accidents, if frauds were not practiced by dealers. Such mixtures are not made by petroleum manufacturers, because the article would be unsaleable. All oils are now tested by regularly appointed inspectors. The oils therefore coming from the manufacturer may be regarded as perfectly safe. The vapor spoken of as passing from illuminating oil at all temperatures, rises very slowly, and is heavier than naptha vapor. It does not occulate in such a quantity as to form, even in a long time, an explosive compound. No fires or accidents have ever occurred in using these tested oils for illuminating purposes.

The subject selected for the next discussion is, the use of water or its vapor as fuel.

Adjourned

American Institute Polytechnic Association,
April 28, 1864.

Chairman, Prof. S. D. Tillman; Secretary, Mr. B. Garvey.

Windmills.

Mr. T. B. Fields, of Nantucket, Mass., exhibited the model of a windmill. Its novelty consisted in the use of balanced sails, moving horizontally around a common axis, each sail having also an independent rotation, by which the edge is presented to the wind when moving against it, and the face when moving with it.

The Chairman remarked that the model displayed some ingenuity, but the objection made to feathered paddle-wheels would apply to this case. The shape of the sails might be improved, by substituting, for the rectangular, the triangular form, by which the base of the sale would have the slowest and its apex the swiftest motion; thus, the extent of the surface of sail varying inversely as its velocity, the force of the wind would be more equable upon the whole length of the arm. The wing of the bird is constructed on this principle. It is narrowest at the point of greatest motion. The windmill is of use where a small power is required, which need not act continuously. It is clumsy, but cheap and convenient, because it requires no replenishing or superintendence when its sails are made so as to close as the wind increases in velocity. Hence considerable ingenuity has been shown in making the windmill automatic or self-adjusting in high winds. Mr. Francis Peabody, a prominent citizen of Salem, has made many expensive experiments for the purpose of perfecting a wind turbine wheel which can be used for farm purposes, and on the prairies of the West, where water-power and fuel for making steam cannot be readily obtained.

Thomas Blanchard.

The recent death of Blanchard was alluded to by Dr. Rowell, who recounted some of the achievements of this distinguished American inventor. He described one of the most useful of his labor-saving machines—the lathe for turning irregular forms, which copies in reduced size if required. A very small marble bust of Webster was exhibited in an unfinished state, as taken from the machine, to illustrate the perfection of the work up to the line where it ceased.

Mr. Stetson also spoke of Blanchard as the inventor of the tack machine.

The Chairman added that the loss of prominent literary men called forth eulogies from their cotemporaries, and it was very proper for this Association to notice the demise of eminent mechanics. He who has given new forms to matter or new directions to force, by which the material condition of man has been improved, has done a real service to his race which may continue in full effect long after the inventor is forgotten. The absolute progress of civilization depends on discovery and invention. It was impossible to carry on a war like the one in which we are now engaged without the aid of the great inventions brought forth first in our own country. Let us always trace true power to its true source, and pay a becoming tribute to the memory of a great inventor.

The following scientific summary was presented by the Chairman:

IMPROVED BAUME SCALE.

This improved scale, as now made in this country, and used by the dealers in coal oil and petroleum, consists of a hollow glass tube about one foot long, closed at both ends, and so weighted as to sink vertically, when set in oil, to a scale which has a range sufficient to include oils and the lighter liquid products of crude petroleum. The zero or lowest point on this scale corresponds with 1 on the ordinary hydrometer, marking the specific gravity of water. From this point the counting is inverted—that is, the lighter the liquid the higher the number, while on the common hydrometer the specific gravity of such liquid would be designated by a decimal fraction. The comparative graduation on these scales will be understood when it is stated that 70 on the Baumé corresponds with 700 on the common hydrometer, which marks the specific gravity of a liquid having 7-10ths the weight of water. Below this scale is a mercurial thermometer, having the zero point of its scale at the point where the mercury indicates a temperature af 60° Fahrenheit—the standard of heat at which all measurements of the density of liquids are made. From this point the scale is graduated above and below, every unit corresponding with ten degrees Fahrenheit. This scale denotes the number to be added to the hydrometer measurement when it is made at a temperature below 60° degrees Fahrenheit, or below the zero point of this attached scale, and the number to be deducted when the measurement is made at a temperature higher than 60° Fahrenheit. For example, if, in measuring an oil, the Baumé scale stands at 39 and its temperature is 30°, marked by 3, being 3 times 10 degrees below the 60° Fahrenheit, this number, 3, is added to 39, and the oil is said to be measured by 42 at the standard temperature; if, on the other hand, this oil should be measured by 45 while the temperature is at 90° Fahrenheit, 3 must be deducted for the excess of temperature—thus we have 42 as its measurement at 60° Fahrenheit. The most correct method is to place in water at 60° a glass tube, open at the top, containing the oil to be tested—the Baumé number measuring this will need no correction for temperature—yet the immense trade in petroleum requires the use of the improved scale described.

A GUN TEST.

M. Decker thinks it possible to determine whether a gun has been fired, and very nearly the number of times, by examining the chemical changes produced by the combustion of the gunpowder, which leaves, both on the interior and exterior of the gun, a blackish blue deposit. The rust of a gun that has been used is different from one that has never been fired.

A NEW PLANET.

A new planet was discovered on the 2d of February last by N. Poyson, Director of the Observatory at Madras. It is the 80th of the series, and has received the name of Sappho.

THE PRODUCTION OF SULPHUR.

M. P. Bianchi gives, in the *Moniteur Scientifique*, some interesting statistics in relation to the production of sulphur in Italy. The annual yield is about 300,000 tons, valued at 30,000,000 francs. The greatest part is obtained in Sicily, where it exists in a gypsum bed, layers of which extend over a small portion of the island from Mount Etna to near Trapani; and also in calcaires and clays more or less marl. In the first case the sulphur exists in a state of mixture; sometimes in small parallel veins, and more rarely in the form of crystals. These are often associated with *cœlestine*, or sulphate of strontium. In clay, on the contrary, it is found in globular masses, which is also the case in similar bearings in Continental Italy. Great improvements have been made in the method of extracting sulphur from the calcareous gangue. It is always obtained by liquefaction, by burning a portion of the ore The operation, formerly performed in small furnaces, is now effected by simply heaping the stones and covering them with earth, as in charcoal burning. This mode diminishes the former losses occasioned by the production of sulphuric acid, so that the yield of sulphur is increased one-fifth. Formerly the burning could not be carried on near dwellings and gardens, and it was often fatal to workmen. Now the operation is almost harmless, and is not confined to any place or period of the year. The sulphur from Romagna and the Marches is refined at Rimini, and is chiefly used for sulphuric acid, and lately for the treatment of the vine. Its price varies considerably; in cakes it is about $43 per ton; in sticks, $52. The value of the crude product of Sicily is from $3 to $5 per ton.

BISMUTH.

The high price of this metal has induced M. Balard to extract it from an old kind of printing type. He dissolves this type, consisting of an alloy of bismuth, lead and tin, in nitric acid. The metastannic acid is separated by filtering, washed with acidulated water and dried; its tin is then reduced by charcoal. Into the remaining liquid, which consists of the nitrates of lead and bismuth, laminæ of lead are plunged, which precipitate the bismuth in a metallic state. The lead is then precipitated from the liquor by the carbonate of soda.

SHEA BUTTER.

This fatty matter, extracted from the fruit of the Bassia Parkei, and used as food in Africa, has been recently analyzed by M. Oudemans. It contains 70.30 of nearly pure stearic acid, and 29.70 of oleic acid. Its point of fusion is 69 deg. C.

PEROXIDE OF HYDROGEN.

M. Schonbein states that this compound, which as oxygenated water is very unstable, can be held at the boiling point for several hours without being decomposed. It is formed by adding the peroxide of barium to boiling water, slightly acidulated by hydrochloric acid, or by agitating boiling water having in it one per cent. of sulphuric acid, with either the amalgam of pasty lead, the amalgam of zinc, or shavings of cadmium. It is also formed when boiling water, containing one per cent. of potash, is added to pyrogallic acid.

A New Voltaic Pile.

The peculiarity of this new invention of Maistre Fils is the employment of iron instead of zinc, and in the arrangement of the charcoal or copper discs, which are circular, and placed on a spindle, as they revolve, one-third of their surface is covered with the liquid in the cups. The exciting liquid is water containing one per cent. of nitric acid.

New Plan for Illumination.

M. Soubra has applied the principle of downward draft to a light by which the flame is inverted. This is accomplished by means of a glass syphon having its open ends turned upward. The longer branch is at first heated, and the flame, which has its base at the top of the shorter branch, is drawn downward, the gases of combustion pass around the curve and upward through the longer branch, which is consequently kept hot, and the draft is thus maintained. The only advantage of this arrangement is in having all the attachments above the flame, so as not to cast a shadow below.

Paper Boilers.

M. Terreil has reported to the Paris Chemical Society curious facts regarding paper subjected to a very high heat upon one side when water is placed on the other. Paper being a slow conductor of heat, there is in reality an osmotic process carried on, by which water, containing metallic salts, is passed through, and the salts are reduced by the flame.

In relation to the item on the manufacture of sulphur, Mr. Enos Stevens stated that Italy was the source of most of the sulphur used in this country. It was imported from Sicily as ballast in vessels laden with oranges.

Mr. L. B. Page expressed the opinion that Canada petroleum would be the source of considerable sulphur. He had obtained half a barrel of sulphur from 130 barrels of Canada rock oil.

The selected subject for discussion was then taken up.

The use of the Vapor of Water with Fuel.

Mr. T. D. Stetson opened the debate by saying the subject had already called forth considerable speculation. We have instances of the practical value of burning water with other materials, in the case of burning wet sugar cane or bagassé, and wet tan bark and wet saw dust, in a furnace especially adapted to that purpose. In these cases the water performs the simple function of changing the mechanical character of the fuel. So also in the case of burning wet ashes. Now these are the cases of the burning of water sufficient to establish the fact, and the utility arising from this mode he considered, was mainly due to the mechanical effect produced by the water in the stirring and mixing of the gases.

We now come to the subject of decomposing water. When water is boiled we make steam, and if the steam is again and farther heated, we have "super-heated steam;" but simply heating the water does not decompose it into its original elements. This can, however, be done by passing steam through a red hot iron pipe, when the oxygen of the water will unite with the iron and the hydrogen of the water will be set free. If steam is passed through heated carbon, in the shape of burning coals, there is no doubt that it aids combustion, and the theory of it is this: the hot bed of coals does not get air or oxygen enough to burn well, now the oxygen of the steam unites with the carbon, and produces a little better combustion. The whole question resolves itself thus, if it requires the same amount of heat to decompose water as can ever be got from it when decomposed, it is certainly cheaper to use heat first without resorting to the decomposing process.

Mr. Bartlett endeavored to make the subject clearly perceptible to every one present by the use of small blocks of wood as symbols of the chemical elements of the various substances used as fuel. He explained the combinations of these elements before and after combustion, and concluded by saying that it is clearly demonstrated by repeated experiments that it takes just as much heat to decompose water as it is possible to get from it by burning the two elements of which it is composed. Therefore the use of water or steam in a furnace produces a loss of heat.

Mr. Bassett, of Salem, Mass., stated that at Providence, R. I., are twelve retorts heated by using super-heated steam in connection with ordinary fuel by which a great saving was effected. The fire-box was filled to the top with coal, and the steam was passed through the sides of the fire-box lined with fine clay into the coal.

Mr. J. Wyatt Reid inquired whether the forcing heated air would not be as effective as steam; he described a furnace in which air heated by passing through hollow grate bars was carried to the centre of the fire.

Mr. Dibben said there was no doubt that there is an economy in the use of steam in a furnace in one way, and that is by preventing iron from burning up. For instance, in burning anthracite coal on iron grate bars, if steam is sent up through the bars, into the fire, some of the intense heat is taken away, and the destruction of the iron is prevented. This is done on locomotives by the Hudson River Railroad Company. The steam also had the effect of clearing the passage through the fire, and there was a more intense heat produced in particular parts of the furnace.

Mr. J. A Miller stated that there were some new furnaces erected in this city, by which as great a saving is effected by using air, as is claimed to be made by using steam; these he would explain in full at the next meeting.

Mr. Fisher took very strong ground against the assertion that there was any gain of heat by the use of water, it was a very old device. Clark, of England, had used it for the purpose of forcing in air to the furnace of a locomotive, but it was not now much used.

Mr. Rosevelt and several other gentlemen spoke.

The discussion was protracted to a late hour, when the Chairman invited Prof. Charles A. Joy, of Columbia College, who had been present throughout, to express his views with regard to the effect of using steam in small quantities in furnaces during the ordinary process of combustion.

Prof. Joy remarked that he had made no experiments for the purpose of throwing light on the point alluded to by the Chairman. He was aware, however, that many devices had been tried to render available the advantages claimed. He did not think it necessary for him to add anything, after the elaborate and interesting manner in which the subject had been treated at this meeting. He valued highly the remarks of several gentlemen who had illustrated on the blackboard new forms of furnaces; it was to him a source of pleasure to meet here with practical men, and to learn from them the results of actual experience.

The Association then decided to continue the discussion of this subject at their next meeting. Adjourned.

INDEX.

A.

PAGE.
Abbott's heater and ventilator ... 563
Acetic fermentation ... 572
Achromatic object glasses ... 410
Acids, organic ... 631
Address of Gen. W. H. Anthon, at the opening of the 35th annual fair ... 42
  Chas. P. Daly, LL.D, on the origin and history of institutions for the promotion of the useful arts ... 45
Adirondac grape ... 281
Africa, tropical ... 552
Agate ... 538
Agricultural departm't, suggestions for the 134
Ailanthus tree ... 134
  silkworms that feed on the leaves of the ... 96
Ainsworth on breeding trout ... 156, 168
Air compressed, as a motor ... 585
  heated, slightly compressed, the use of, 586
Albumen, coagulation of ... 610
  transformation of ... 596
Almonds in California ... 287
Alum, thallium ... 584
Aluminum bronze ... 537
American Watch Company ... 405
Amethyst ... 538
Ammoniacal salts ... 351
Ammoniated guano ... 155
Anasthetic ... 537, 538
Analine colors ... 584
Analysis of barley straw ... 141
  rye straw ... 141
  urine ... 344
  wheat straw ... 141
Aneroid barometer ... 423
Animal dung ... 137
  manures ... 139
  matter, preservation of ... 622
Animals, instinct of ... 302
  new species of ... 632
Anthon's address at the opening of the 35th annual fair ... 42
Anti adipose ... 536
Ants and beetles, a remedy for ... 80, 122
  destructive ... 601
Aphides ... 270
Apples ... 108, 335, 379
  autumn varieties ... 328
  Northern Spy ... 108
  preservation of ... 86, 95
  seeds, how and when to plant ... 213
  summer varieties ... 327
  Tompkins County King ... 315
  winter varieties ... 328, 329
Apple trees, coal tar as a remedy for borers in ... 107
  to prevent bark blight on ... 283
  varieties to plant ... 327

PAGE.
Armory at Springfield, Mass ... 457
Artesian mining ... 572
Artificial marble ... 547
Asteroid, a new ... 531
Atmosphere, diversity of the ... 602

B.

Bagasse for manure ... 317
Baloon ascensions in Great Britain ... 558
Barley, how it is sown in Russia ... 247
Barnard on the explosive force of gunpowder ... 506
Barometers ... 204, 422, 608
Barren currants ... 124
Baumé scale ... 653
Beans for winter use, preserving of ... 82
Bee culture ... 189
  moth trap ... 187
Bees, keeping of, in cities ... 375
Bigelow, E. B., notice of ... 565
Billion, estimate of ... 598
Birds as destroyers of insects ... 102
Bismuth ... 654
Blanchard, Thos., notice of ... 565, 652
Blood corpuscles ... 601
Blinn on the manufacture of maple sugar, 364
Blunt's dividing engine ... 417
Body measure ... 428
  waste of the ... 615
Bogardus, Jas., communication from ... 642
  notice of ... 565
Boilers, corrosion of ... 613
Boiling of water ... 647
  point as a test ... 595
Bomford gun ... 630
Bone, reproduction of, a prize offered by France ... 566
Borer on fruit trees, effects of the ... 157
  remedy for the ... 198
Botanical works ... 125
Boyden's new strawberry ... 121
Braisted's hose-coupling ... 476
Bran as a fertilizer ... 378
Brick, can they be made without clay? ... 214
Brine for manure ... 183
Bromine, its use in photography ... 557
Bugs, do they bite plants? ... 109
  on potatoes, do they cause the rot? 80
Burden, Henry, notice of ... 566
Bursting of guns ... 534
Butter worker ... 91

C.

Cabbage fleas, a cure for ... 297, 312
  how to grow short-legged ... 129
Calabar ... 631
California beer plant ... 94
Caloric engine ... 636
Cannon ... 394, 450
  cause of the bursting of ... 506

PAGE.
Carbon, the spectrum ... 641
Carnelian ... 538
Carrots, cutivation of ... 194
Casting, explosion of a ... 394
Castor oil ... 547
Caterpillars, how to get rid of them, 155, 187
Cats, value of, on the farm ... 97
Cement flooring for stables ... 152
Cephalometer ... 430
Cereals, decortication of ... 547
Chandlers' greaves for manure ... 183
Cheese, changes in ... 631
  making ... 322
Chemical manufactures on the Tyne ... 548
Cherries, time to bud ... 332
Chlorides, new ... 553
Chocolate, manufacture of ... 597
Churning cream ... 331
Cisterns, how to make, in springy ground. 211
City locomotives ... 394
Clark's improved conformeter ... 476
Clepsydra ... 402
Climate, theory of ... 89, 98
Clocks, brass ... 413
  metal ... 412
  wooden ... 411
Clothes-drying machine ... 372
Clover, red, are there two kinds of? ... 309
Coal formation, origin of ... 440
  in Great Britain ... 553
  products of its distillation ... 570
  tar, for apple-tree borers ... 107
Cobalt colors ... 573
Color blindness ... 638
Colt, Samuel, notice of ... 565
Comet, Wilson's ... 616
Comparative anatomy of fishes, a prize offered for a ... 597
Compost manures ... 136, 298
Condensation, partial, for high pressure engines ... 612
Condensers, surface ... 591, 602, 612
Cooking vessels for stock ... 112
Cooper, Peter, notice of ... 564
Copper mines of Canada ... 480
Cord-covering machines ... 478
Corn and potatoes ... 94, 275
  bread and meal, how to preserve ... 112
  from Pompeii. ... 536
  roots, disturbing ... 132, 272
  stalk cutters ... 270
  stalks for forage, value of, 184, 207, 277, 300, 302, 374
  making sugar from ... 397
  yield of, in Minnesota ... 129
Cornelian ... 538
Correlation of mechanical and chemical forces ... 590
Cotton ... 100, 101
  and melons in Virginia ... 153
Coupling ... 476
Cow-milker ... 153
Cows teats, cure of warts on ... 154
Craineometer ... 429
Cranberries ... 375
Crops, average of, in England ... 358, 359
Crows, food of, in winter ... 292
Cultivation of flowers, how to produce double blossoms ... 307
Cultivator, improved ... 212
Culvert, improved suspension ... 474

D

Dairy implement ... 121
Dahlgren gun ... 619

PAGE.
Daly, Chas. P., address on the origin and history of institutions for the promotion of the useful arts ... 45
Davy lamp, improved ... 600
Dederick's hay press ... 477
Deers' horns, what becomes of them? ... 116
Delano's stove ... 483
Delegates to the Hamburg international exhibition ... 1
Developer, a new ... 578
Diamond ... 538
Diapason ... 630
Dioscorea batata ... 280
Disease from eating diseased pork ... 595
Ditching machines ... 373
Doughty, Samuel, death of ... 122
Draper's glass reflector ... 488
Dreaming and somnambulism ... 632
Droughts ... 135, 563
Duchy of Holstein, agriculture in ... 89
Dyes, soluble blue ... 615
Dynamometers ... 429

E.

Eames' water engine ... 582
Earth, mean temperature of the ... 561
  secular cooling of the ... 609
Earthquakes, periodicity of ... 583
Engine of Blanchard ... 637
Engraving by etching ... 590
  electrotype ... 589
  machine ... 643
Electric fly ... 640
  light-house ... 573
Electricity and magnetism ... 539, 548, 554
  in asthma ... 577
Electrotypes ... 591
Elliptic sewing-machine ... 479
Ericson, John, notice of ... 566
Essential oils ... 556, 600
Essex, history of the ... 483
Explosive compound, a new ... 588

F.

Farmers' Club, proceedings of ... 78–384
  rules for its government ... 78
Farming in Maine ... 313
  under difficulties ... 274, 313
Fence posts, cheap way to make ... 302
Fences ... 265
Fermentation, new facts in relation to ... 623
Fertilization of crops ... 244
Fibrous plants, 79, 111, 193, 214, 258, 311, 316, 374
Filtering cistern water ... 375, 376
Fires from spontaneous combustion ... 386
Fish breeding ... 156, 168
Flax cotton ... 84
  mill in Ohio ... 567
  crop ... 107
  culture ... 190
  machines ... 116
Flower seeds ... 105, 183, 267
Foci of the lens ... 488
Food, adulteration of ... 557
Foot measure ... 428
Foot's regulator ... 420
Friction matches, the inventor of ... 565
Fruit injured by packing ... 206
  prospects of ... 106
  trees, soda wash for ... 197
Fruits for the vicinity of New York ... 319
Fuel, the use of the vapor of, with ... 655
Furnace for boilers ... 501

G.

Page.
Gas burners 447
  burning stoves 452
  from coal oil 558
    petroleum 548
  manufacture of illuminating 567
  metres, dry 642
Gases, molecular mobility of 552
Gauge, steam pressure 539
Generation, spontaneous 596
Geological 618
Glacial epoch 649
Glass, silvering of 573
Glucose 631
Gold mines 526
  separation of 637
Goodyear, Chas., notice of 565
Gooseberries, how to grow them 378
Gooseberry blight 82
  bushes, insects on 109
Governor for steam engines 549
Grafting, 86, 110, 174, 199, 208, 241, 305, 313, 332
  the wild cherry 129
  wax 128, 373
Grafts, preserving of 311
Grape culture and manufacture of wine .. 284
  condition of success in, 176, 201
  cure 260
  cuttings as a fertilizer 283
  vines, injured by winter covering... 293
    location and cultivation of.... 247
    should they be grown in an orchard 85
Grapes, 157, 172, 209, 218, 244, 266, 279, 281, 303
  for a high latitude 251
  lectures on the 175
  must of 572
  suitable for families 188
    Vermont 95
  that will do for Eastern Pennsylvania 321
Grain drills 270
Granite, composition of 538
Grass, value of 185
Grasses 279
Greek fire 453
Green crops, when to plow under 84, 125
Guano, ammoniated 155
  Pacific Island 158
Gun barrels, how made 459
  boats of light draft 574
  cotton 531
  for a 1000 lb. shot, cast at Fort Pitt Foundery 596
  stocks, how made 465
  test 653
Gunpowder, explosive force of 507
  substitute for 600
Guns and gunboats 483, 627
  a new tompion for 576
  casting of great 597
Gutta percha paint 264

H.

Hamburg International Exhibition ... 2, 567
  report of Austin Baldwin on the 2
Haraszthy on grape culture and maufacture of wine 284, 288
Harrison and Schnitzer's globe lenses 442
Hawthorn for stocks for budding 106

Page.
Hay, management of, in mow or stack, 203, 255, 303
  press 477
  rake 88
  tedder 114
Head measures 428, 429, 430, 476
Heat of the sun's rays 601
  regulators 417, 419
  transmission of, by mercury 454
Hearing, unequal power of the organs of, 624
Heaves in horses, a remedy for 189
Hedges and hedge plants .. 171, 245, 251, 313
Henna 601
Henry, Joseph, notice of 564
Hickok's potato plow or digger 161
Highway repairs, the law of 163
Hite's seedling strawberries, description of, 115
Hoe, R. M., notice of 565
Hogs, how to feed 248, 277
Horology 402, 410
Horse feed 373
  the pure Arabian 632
House's button-hole machine 470
Howe, E., notice of 565
Human race, origin of the 432
  strength 480
Hydrogen, peroxide of 659
Hydrometers 425, 431

I.

Ice houses for preserving fruit 112
  used in cities 644
Illumination, a new plan of 655
Imphee 397
Inarching 306
India rubber and iron targets 575
  car springs 416
  treatment of 584
Indium 530
Ink plant 640
Insects infecting fruit trees, 83, 92, 93, 96, 101, 109, 119, 123, 257
  potatoes 108
  protection from 96
  what are they? 110
Iodide of mercury, decomposition of 609
Iron 618, 627
  action of compressed oxygen upon.... 566
  and its application to war vessels 618
  clad Monitors 486, 503
    vessels of war, 483, 493, 496, 502, 522, 618
  girders 610
  ores of Missouri 599
  produced in Great Britain in 1863 552
Isabella grape, a plea for the 209

J.

Jasper 538
Jennings, I., notice of 565

K.

Kansas, natural productions of 166
Kellogg's new repeating gun 520
Kettle for boiling water 473

L.

Laboratories compared 600
Lalande prize 596
Lambs, mortality among 382
Lampas in colts 126
Lands in Kansas and Nebraska 154
Lead and its oxydes, with re-agents 542

Page.
Lead ore, reduction of ... 645
  pipe, action of water upon ... 541
  poisoning ... 530, 546
Leer's new submerged paddle-wheel ... 501
Lens for the camera ... 442
Lessoffsky, Admiral, letter of ... 479
Licorice, cultivation of ... 217
Light, direct and diffused ... 584
  impressions of ... 633
  upon leaves, action of ... 573
Lima beans and squashes ... 114
Lime, a new hydrate of ... 577
Link motion ... 474
Liquid manure ... 336
Locusts ... 88, 110, 119
Lupine as a green manure ... 264

M.

Madder, cultivation of ... 184
Mad itch in cattle ... 271
Magnetic storms ... 608
Magnesium light ... 641
  lime, injurious ... 301
Magnetism and electricity ... 539, 548, 554, 577
  residual ... 639
Manton's new furnace for boilers ... 501
Manufacture of tin-lined lead pipe ... 525
Manure, brine for ... 183
  chandlers' greaves for ... 183
  compost ... 136
  hen ... 331, 377
  how to destroy foul weeds in ... 185
  is it benefited or injured by heating? ... 363
  liquid ... 336
  poudrette ... 281
  production of, on a farm ... 351
Maple sugar ... 361, 364, 368
  trees, how to increase the flow of sap in ... 366
  trees, planting by the roadside ... 363
  tapping of ... 362
Marbles, composition of ... 538
Marl in Canada ... 191
McCormick, C. H., notice of ... 565
McIntire's improved suspension culvert ... 474
Mead on grape culture ... 176
Meadows, sward bound ... 153
Measuring instruments ... 425, 428
  worm ... 102
Meat rations of the people of New York ... 270
Meeker on grape-growing and making of wine ... 218
Melon, a new kind of ... 250
  bugs, remedy for, 92, 109, 123, 129, 372
  seeds from the Amazon ... 78
Men of progress ... 564
Meteorology ... 558
Metre, length of ... 598
Michigan marshes, what shall be done with them? ... 179, 321
Mile standard in different countries ... 598
Milk, measuring the quality of ... 371
Minnesota, climate of ... 305
  farming ... 304
  fruit-growing in ... 303
  wildflowers ... 205
Moon, does the appearance of the, indicate wet or dry weather? ... 153
  effects of, on plants and animals, 91, 158
    163, 164, 184, 195
Morse, S. F. B., notice of ... 564
Morton, W. T. G., notice of ... 565
Mott, Jordan L., notice of ... 566
Musical sounds, perception of ... 629
Mustard in Illinois ... 247

N.

Nash on grafting of fruit ... 332
New York city, health of ... 591
  meat rations of the people of ... 270
Nickel ... 551
Nightsoil ... 86, 281, 359
Nott, E., notice of ... 564
Novelties at the fair ... 442, 452, 470, 474

O.

Oat aphis ... 80
Ocean currents ... 575
  navigation ... 451
Oil analyzing apparatus ... 594
  an antidote for worms on trees ... 125, 155
  olive, how adulterated ... 557
Oils, testing of, by their cohesive figures ... 623
Opal ... 538
Orchard, proportion of trees for planting ... 347
  soil and situation of an ... 327
  varieties of apples to plant ... 327
Origin of the coal formations ... 440
  human race ... 432
Osier willows ... 162
Owens' regulator ... 421
Oxen in harness ... 281, 380
Oxidation of alcohols ... 567
Oxide of a new metal ... 552
Oxygen in organic compounds ... 552
  without heat, production of ... 640
Ozone ... 531

P.

Pacific telegraph ... 482
Paint for out-buildings ... 252, 264
Paixhan gun ... 630
Paper boilers ... 655
  for mailing plants ... 248
  made from New Zealand flax ... 589
  negatives ... 578
Parasitic pestilence in Iceland ... 577
Parsnips, are they ever poisonous? ... 369
Peach trees, curl of the leaf of ... 130, 287
  do they need protection? 104, 126
    129
  yellows in ... 104
Pear culture ... 198, 250, 276
  tree blight ... 110, 133
Pearl oysters ... 621
Pears, autumn varieties ... 329
  for home use ... 329
  on quince ... 106
  preserved in hay seed ... 308
  suited to Wisconsin ... 194
  summer varieties ... 330
  winter varieties ... 330
Peat ... 191, 192
Pell on compost manures ... 136
  liquid manures ... 336
Petroleum ... 531, 649
  gas from ... 548, 569
  in Russia ... 567
  waste of ... 650
Phosphorus ... 547
Pickles ... 292
Pipes for conveying water ... 541, 550
Pitch of sound ... 630
Planet Sappho ... 653
Planets, relative distances of the ... 552

PAGE.

- Plants from slips, how to grow ... 174
  - how to grow in primitive earth or rock 253
- Plaster as a fertilizer ... 277, 325
  - when to sow ... 308
- Plate armor for sea-going vessels ... 496
- Plows, subsoil ... 193, 283
- Plums of Minnesota ... 213
- Plum trees, the black knot on ... 117, 274
- Poison ivy, cures for ... 155
- Polariscope ... 622
- Polarized light affected by magnetism ... 549
- Polytechnic Association, proceedings of the ... 385–657
  - rules established for its government ... 385
- Pomeroy's governor for steam engines ... 349
- Ponton bridge ... 645
- Pork, dry salting of ... 256
  - value of cooked food, for making ... 300
- Potato rot ... 324
  - plaster and salt a remedy for the, 129
  - theorists ... 87
- Potatoes, 80, 106, 108, 120, 184, 190, 191, 197, 280
  - how they should be planted ... 293
- Poultry, how to fatten ... 155
- Power, manual, horse, steam and electric, compared ... 540
- Prairies, planting forest trees upon the, 323, 370
  - when to break up ... 383
- Premiums awarded in 1863 ... 22
- Preservation of meat ... 600
- Preserving fruit in hay seeds ... 308
  - ice houses ... 112
- Prince on licorice ... 217
  - sumach ... 216
- Proceedings of the Farmers' Club ... 78–384
  - Institute ... 7–14
  - Polytechnic Association ... 385–657
- Prunes ... 172

Q.

- Quartz ... 538
- Quinces, propagating of ... 120, 128

R.

- Race's regulator ... 420
- Railway bridge across the Susquehanna ... 602
  - elevated, for new York city ... 617
  - underground ... 616
- Rainbow, artificial ... 624
- Ram Dunderburg ... 503
- Raspberry, Brinckle's Orange ... 326
  - bushes, disease of ... 117, 120
  - Franconia ... 326
  - the red cane ... 93
  - winter killing of the ... 326
- Rats, a remedy for ... 125
- Reciprocal action between plants and gases, 537
- Reclaiming marsh land ... 321, 379
- Reenstjener's new steam slide valve ... 520
- Repeating gun ... 520
- Report of Austin Baldwin on Exhibition at Hamburg ... 2
  - the board of managers of the 35th annual fair ... 16
  - the committee on agriculture ... 7
    - manufactures, science and art ... 9
  - Shaw & Justice's new mercury steam pressure gauge ... 624
- Report of committee on steam boilers ... 532
  - the use of lead pipe and tin-lined lead pipe for conveying water ... 541
  - water pipes ... 550
  - finance committee ... 13
  - library committee ... 11
  - trustees of the American Institute ... 1
- Retina, images on the ... 663
- Rhubarb vinegar ... 163
  - wine ... 262, 310
- Rifle ball ... 528
- Roaches and croton bugs ... 125
- Roberts' new steam slide valve ... 520
- Roots' new steam engine ... 399
- Ropers' caloric engine ... 636
- Roses, slugs on ... 197
- Ruby ... 538
- Russia, intercourse with ... 482
  - sheet iron ... 482

S.

- Salt as a manure ... 292
  - discovery of a mountain of ... 99
- Salting pork ... 256
- Salts in rain water ... 536
  - of thallium ... 536
- San Francisco, climate of ... 561
- Sap, cause, of the circulation of ... 367
- Sapphire ... 538
- Saxton, J., notice of ... 565
- Science, ancient and modern ... 417
- Seaweed, utilization of ... 611
- Seedling apples ... 95, 194
  - magnolia ... 79
  - strawberries ... 115, 121, 161
- Seeds and plants, how to send by mail ... 377
  - exchange of ... 196
  - from California ... 182
- Sewing machines ... 454, 470, 479
  - its history and progress, 455
- Shaw and Justice's new steam pressure gauge ... 539, 624
- Shea butter ... 654
- Sheep, hornless Spanish buck ... 292
  - why grow horns upon? ... 265
- Silesian wool ... 152
- Silkweed ... 185
- Silkworms that feed upon ailanthus ... 96
- Sirius and its companion ... 578
- Slugs on cherry trees ... 187, 197, 267
- Snow, limits of perpetual ... 632
  - the poor man's manure ... 295
- Soapmakers' waste, its value ... 299
- Soda compounds, importation of ... 553
- Soil and situation of an orchard ... 326
  - for flowers ... 378
  - injured by burning ... 293
- Solar radiation, intensity of ... 621
  - rays ... 532, 601, 621
    - chemical action of the ... 536
  - spots ... 649
- Soldiers' orphans, appeal in behalf of ... 161
- Sorgo, cultivation of ... 103
  - seeds, how to increase the germination of ... 368
  - syrup ... 188, 312, 396
- Spectrum test ... 584
- Spinning machinery, drawing rollers for 611
- Sponge, bleaching of ... 621
- Squashes, are they monoecoius ... 116
- Stables, cement flooring for ... 152

Page.

- Stars, binary, orbits of 616
- Stars, shooting 624
- Steamboat, a fast 427
- Steam boiler explosions 576
    - inspectors of 567
  - cars for city locomotion 394
  - engine, Roots' 399
  - experiments with 427, 441
  - slide valve 506, 520
  - superheating of 441, 469
- Steel 627
  - boilers 639
  - by the Bessimer process 591
  - improvements of 584
  - porosity of cast 583
  - rails 616
  - tubes 629
- Stomach, why is it not digested? 536
- Stone, preservation of 537
- Storms, course of 562
- Strawberries, ever-bearing 158, 331
  - immense production of, 130, 156, 393
  - in Illinois 101
  - irrigation of 152
  - when to set out 152
- Strawberry beds 82, 121, 161
  - the Austin 156
    - Boyden's new 121
    - Wilson 321
- Street-sweeping machine 427
- Submarine cable 589
- Submerged paddle-wheel 501
- Sunflower, cultivation of the 185
- Sumach described 188, 215, 216
- Sugar from the beet 308, 393, 397
  - cornstalk 397
  - maple 361, 364, 368, 396, 397
  - manufacture of, at the North, 387, 395
- Sulphur, production of 653
- Sulphuric acid, purification of 609
- Sweet corn in Minnesota 162

T.

- Tea, adulteration of 644
  - plant, a new 79, 97, 124, 170, 172
- Tekah 124
- Telegraph, electric 554
  - the world's 616
- Temperature at different altitudes 559
- Thermometers 417, 422
- Tidal power, useful application of 581
- Tide gauge 581
  - mills 581
  - waves and wind waves 578
- Timber for durability, when to cut, 272, 291, 303
- Tobacco growing 250
  - tools to cultivate 85
- Tomato vines, a remedy for melon bugs 123
- Topaz 538
- Traction engine 447

Page.

- Transit through the city of New York 634
- Tree, cotton 100, 167
- Trees, do the trunks of, lengthen 278
  - how to grow for the nursery 213
- Trout-breeding 156, 168
- Tunnels, cost of 635
- Turner & Palmer's machine for covering cord 478
- Turnips 273
- Turpentine from Northern pine 283, 361
- Turquoise 538
- Typhoid fever 577

U.

- Ultra marine 573
- Undulations, effects of 549
- United States Armory at Springfield, Mass. 457
- Urea 615
- Utilization of waste products 650

V.

- Valata 622
- Vanadium 551
- Vattemare, A., death of 383
- Ventilation of farm houses 294, 322
- Ventilator 563
- Ventilators for barns 382
- Verde antique 538
- Vibrations, transverse 452
- Voltaic pile 655

W.

- Wagon, dumping 378, 637
- Waste of coal oil and petroleum 650
- Watch Company, the American 405
- Waterbury's new rifle ball 528
- Water, boiling of 647
  - engine 582
  - melons 323
- Weather and weather prophets 577
  - signs 646
- Weights and measures 638
  - reform in 582
- West Jersey soil 290
- Wheat and spelt 249
- Whisky, converting it into brandy 249
- White's new apple-parer 310
- Windmill 652
- Wilcox & Gibbs' sewing-machine 454
- Willard & Shaw's method of making tin-lined lead pipe 525
- Wine interests of California 288
  - maker's guide 193
  - making 218, 284, 288, 324
  - plant—Linæus rhubarb 205
  - residuum of, found in the bottle 273
- Wooden clocks 411
- Wolfram or tungsten 631
- Wrench, a new 477

Y.

- Yard, various standards 593
- Yeast cakes, how to make 122

ERRATA.

On page 629, last line, for "vane" read "vase."

On page 488, on twenty-third and twenty-fourth lines, for "millions" read "million of millions."

On page 644, in sixth line, for "extract" read "exact."